AUTOMOTIVE INDUSTRIES

AI

AUGUST 15, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue . . . Scrap Disposal by Automation . . . New Air Starters . . . Brazing Titanium . . . Multi-Fuel Diesel . . . Small French Car . . . Large Aluminum Forging Design . . . Sub-Zero Starting . . . Doubling Welding Speed

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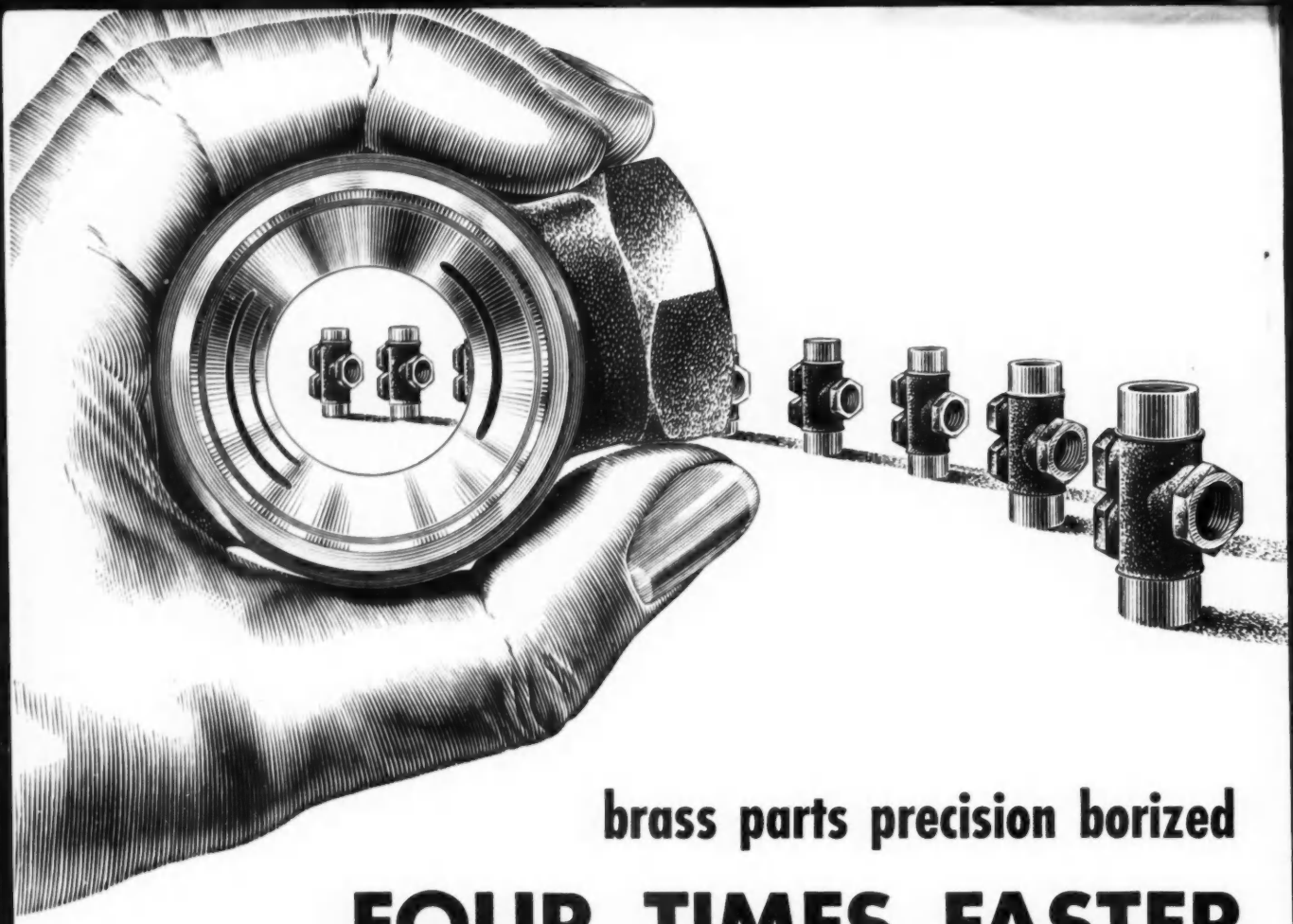


brass parts precision borized

FOUR TIMES FASTER

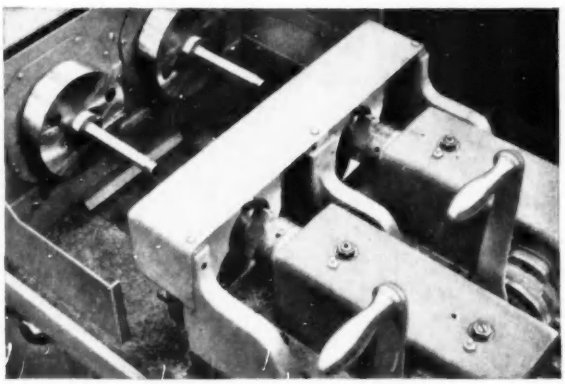
. . . with higher accuracy and better finish, too!

● No wonder this Heald customer is pleased.

Compared to the method previously used, his new Bore-Matic has multiplied air-valve production *four times!*

This one machine, a Model 124 Bore-Matic, finishes 15 different sizes and types of valve bodies. What's more, borizing of the rough-reamed parts produces a bore that's straight, round and within .0002" for size. Scrap losses have dropped to the vanishing point. And the new machine is far easier to operate, requiring less operator training.

Remember—when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

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THE HEALD MACHINE COMPANY

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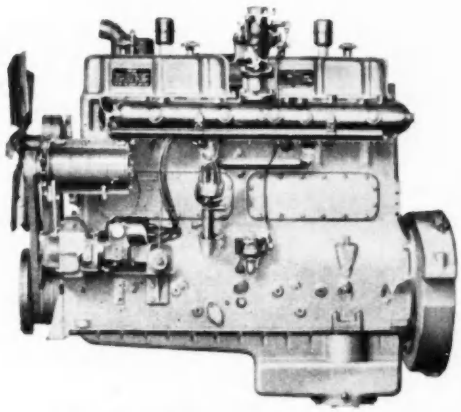
ATOMIC ENERGY
installations and production
PROTECTED

by 22 of these HOWE pumpers

powered with WAUKESHA FIRE FIGHTER ENGINES



WAUKESHA 145-GZB High Output FIRE FIGHTER ENGINE—six cylinders, 5⅜-in. bore x 6-in. stroke, 817 cu. in. displ., with counterbalanced and vibration dampened 3½-in. 7-bearing hardened crankshaft; dual ignition; precision extra high capacity bearings; overhead valves with Stellite-faced exhaust valves and seats; removable wet sleeve cylinders. Arranged for full electrical equipment and all modern accessories. Send for Bulletin 1594.

Fire fighting power must be faster, and most reliable at Los Alamos, New Mexico. Here are the Atomic Energy Commission installations. Every safeguard must be used to protect them and their production! Here, too, high altitude complicates the problem; demands plus performance from the power plant! But the *high output* of Waukesha Fire Fighter Engines fully meets both road and pumping needs. For these *Howe Pumpers*... Underwriter rated 750 g.p.m. Class A, with 150-gal. booster tanks, and full complementary equipment... are built by Howe Fire Apparatus Co., Anderson, Indiana, and are powered with Model 145 Waukesha Fire Fighter Engines. At Los Alamos there are ten of these *Howe Pumpers* and the Atomic Energy Commission has twelve more such Waukesha-powered *Howe* units protecting their Atlanta, Georgia installations.

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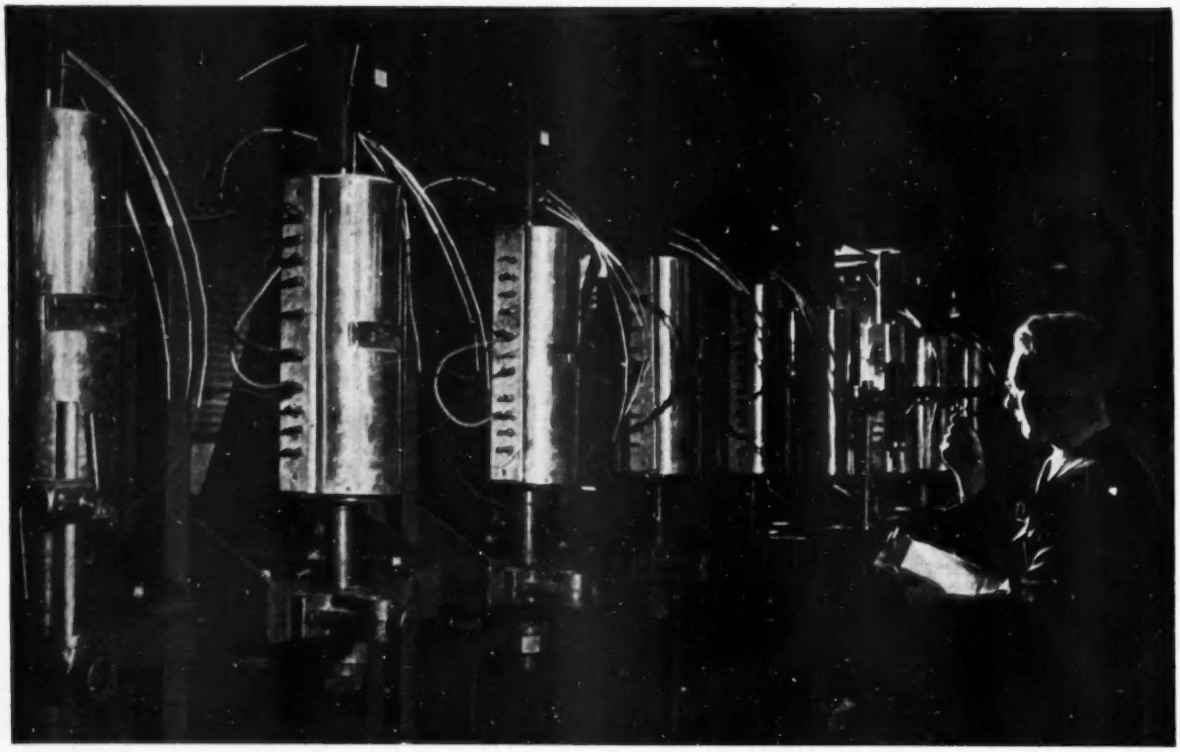

Where Metals Give Up Their Secrets

Suppose you want a metal to combat some particularly destructive set of service conditions.

Here's a man who can help you.

He's one of INCO's staff of engineering specialists and metallurgists. His primary responsibility is to determine how well a material qualifies for its intended use.

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Suppose, for example, you were caught in a predicament where you had to find a corrosion-resisting material with greater strength and hardness than you can get even in Monel®. He can name you an age-hardenable alloy that has the same excellent resistance as Monel *plus* mechanical properties you would expect to get only in a heat-treated alloy steel. Non-magnetic, too, down to −150° F. below zero. It is "K"® Monel, one of the INCO Nickel Alloys.

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If you are wrestling with any problem that involves metals, let him lend a hand. There's no charge, no obligation. If one of the INCO Nickel Alloys cannot solve your problem, he may be able to recommend another metal that will. A note to "Technical Service" at this address will receive prompt attention:

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A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

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AUGUST 15, 1953 VOL. 109, NO. 4

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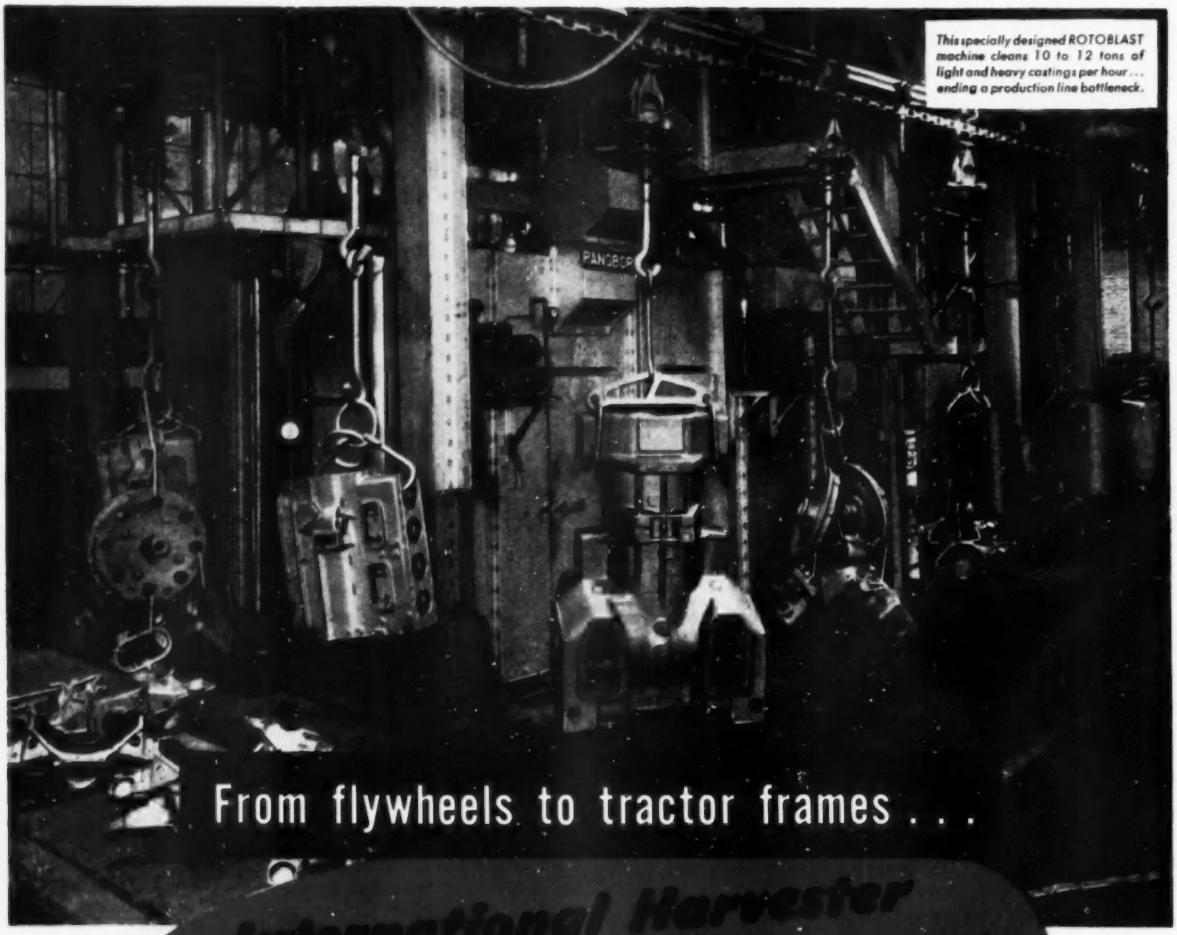
This specially designed ROTOBLAST machine cleans 10 to 12 tons of light and heavy castings per hour . . . ending a production line bottleneck.
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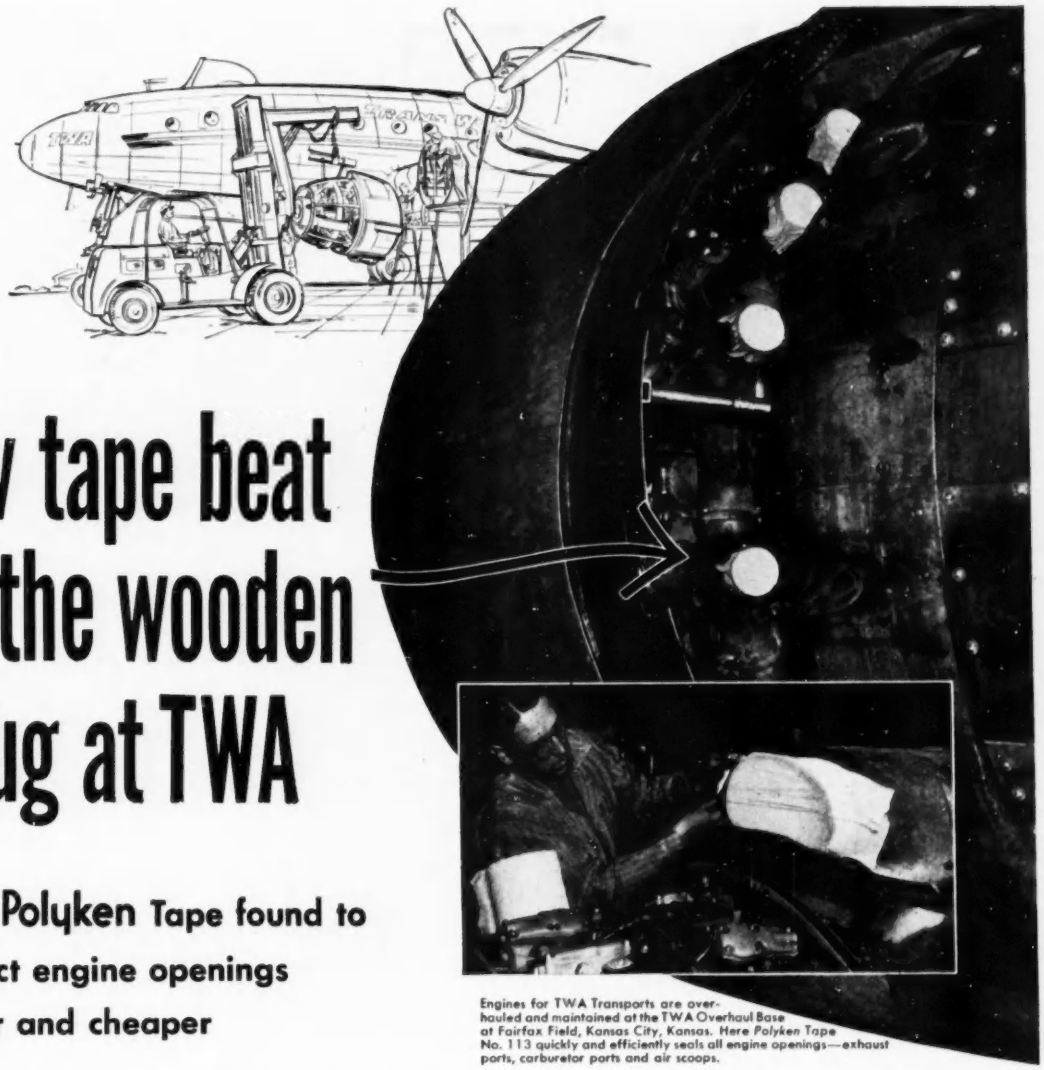

How tape beat out the wooden plug at TWA

New Polyken Tape found to protect engine openings better and cheaper

Engines for TWA Transports are overhauled and maintained at the TWA Overhaul Base at Fairfax Field, Kansas City, Kansas. Here *Polyken* Tape No. 113 quickly and efficiently seals all engine openings—exhaust ports, carburetor ports and air scoops.

TWA needed an effective but low-cost way to seal the openings of aircraft engines during overhaul. Unless they were sealed, all the exhaust and carburetor ports and air scoops were open invitations to damage by dirt and foreign matter.

The usual way of sealing these openings was wooden plugs . . . but the seal wasn't always complete, the plugs were expensive, sometimes difficult to fit and bulky to store.

For over a year now TWA has been using *Polyken* Tape No. 113 to seal all these engine openings. In just a fraction of the time it took to fit the old wooden plugs, the ports are *completely* sealed with easily handled *Polyken* Tape.

TWA's use of *Polyken* Tape No. 113 is one more example of how tape that's "tailored to the job" can do things you never dreamed tape could do. Let us study your problem and recommend the *Polyken* Tape that will solve your problem with a saving of time and money. Use the coupon for samples and complete information.

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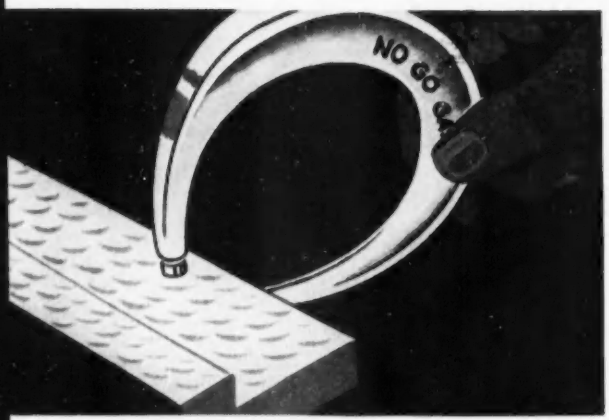
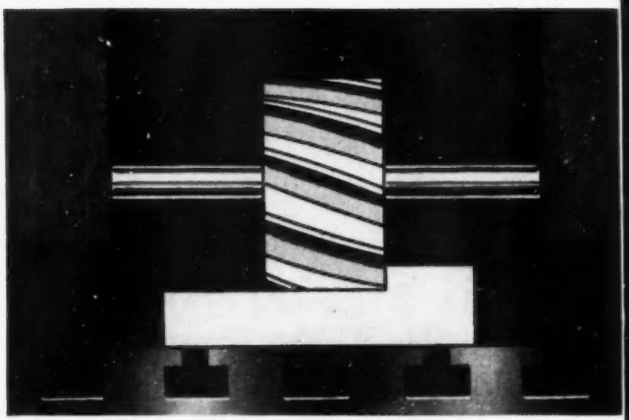
HOW TO END DAMAGED WAYS, PRODUCTION LOSSES

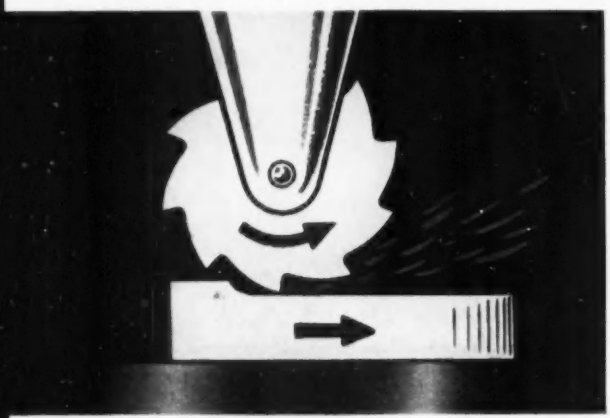
Sunoco Way Lubricant Stops "Jumpy Table"



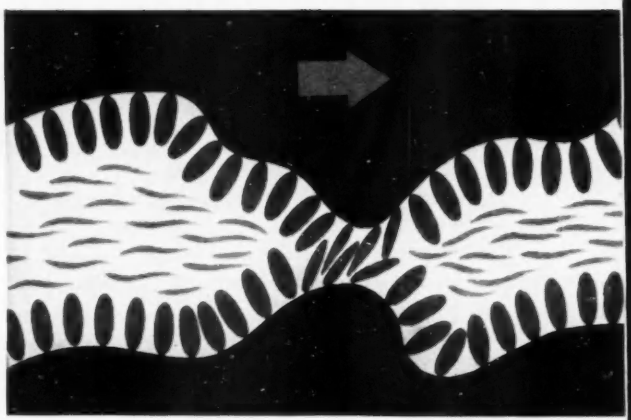
Tool chatter and jumpy table are machining headaches. Too often they cause poor surface finish, failure to hold tolerances, production losses.



Tool chatter is a result of a lack of rigidity in either the machine or the set-up. It is a mechanical problem and no lubricant can lick it.



Jumpy table is a stick . . . slip . . . stick . . . slip action of the table. It is a lubrication problem. Though just as damaging as tool chatter, it is not always detected when the cause of poor surface finishes.



Extreme magnification

Sunoco Way Lubricant cures jumpy table. It contains special compounds that form a film, like the nap of a rug, on the sliding surfaces and minimize the force of both static and kinetic friction.

Why take a chance of damaging your ways? These integral parts of the base casting for your machine are difficult to refinish and costly to replace. For information about Sunoco Way Lubricant, call a Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-8.

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United Oil Bath Air Cleaners are substantially lengthening the life of every type of internal combustion engine — on cars, trucks, buses, tractors, stationary power units.

Specialists for over 30 years in the development of air cleaners, United has models available to fit every requirement. We invite you to consult with our sales engineers on your specific needs.

1953 Nash Statesman.

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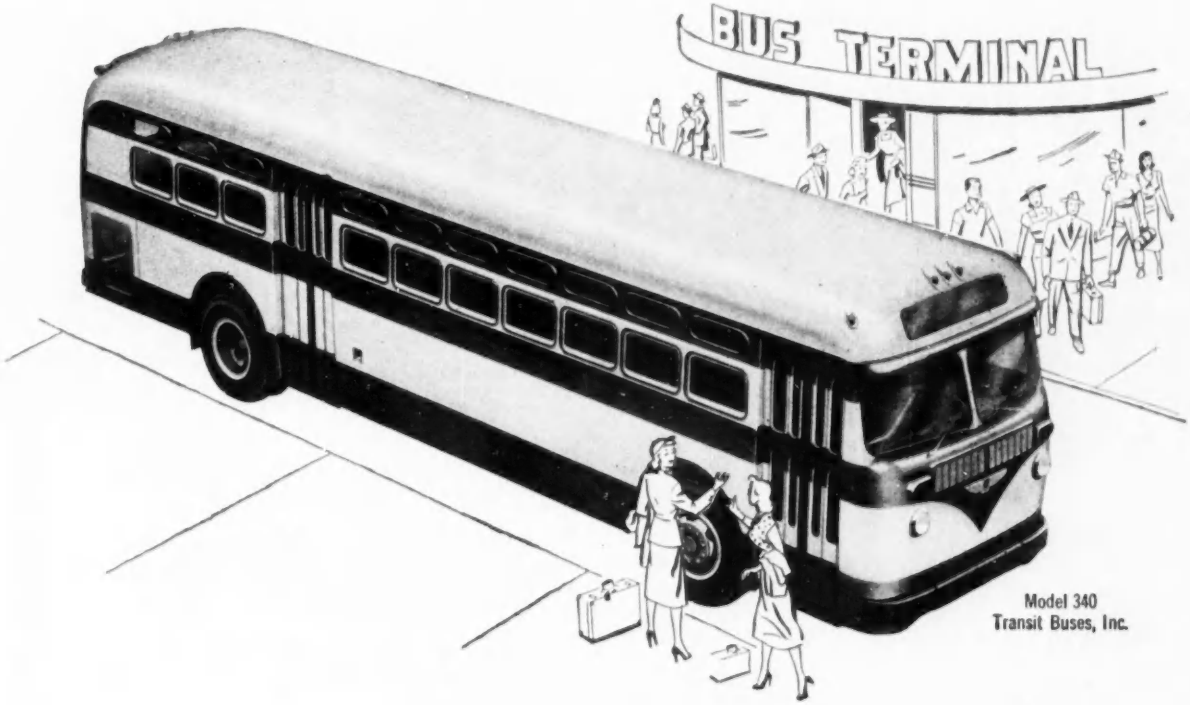

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Roller-Mounted
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Type

CAM & LEVER MANUAL . . . HYDRAPOWER INTEGERAL . . . HYDRAPOWER LINKAGE

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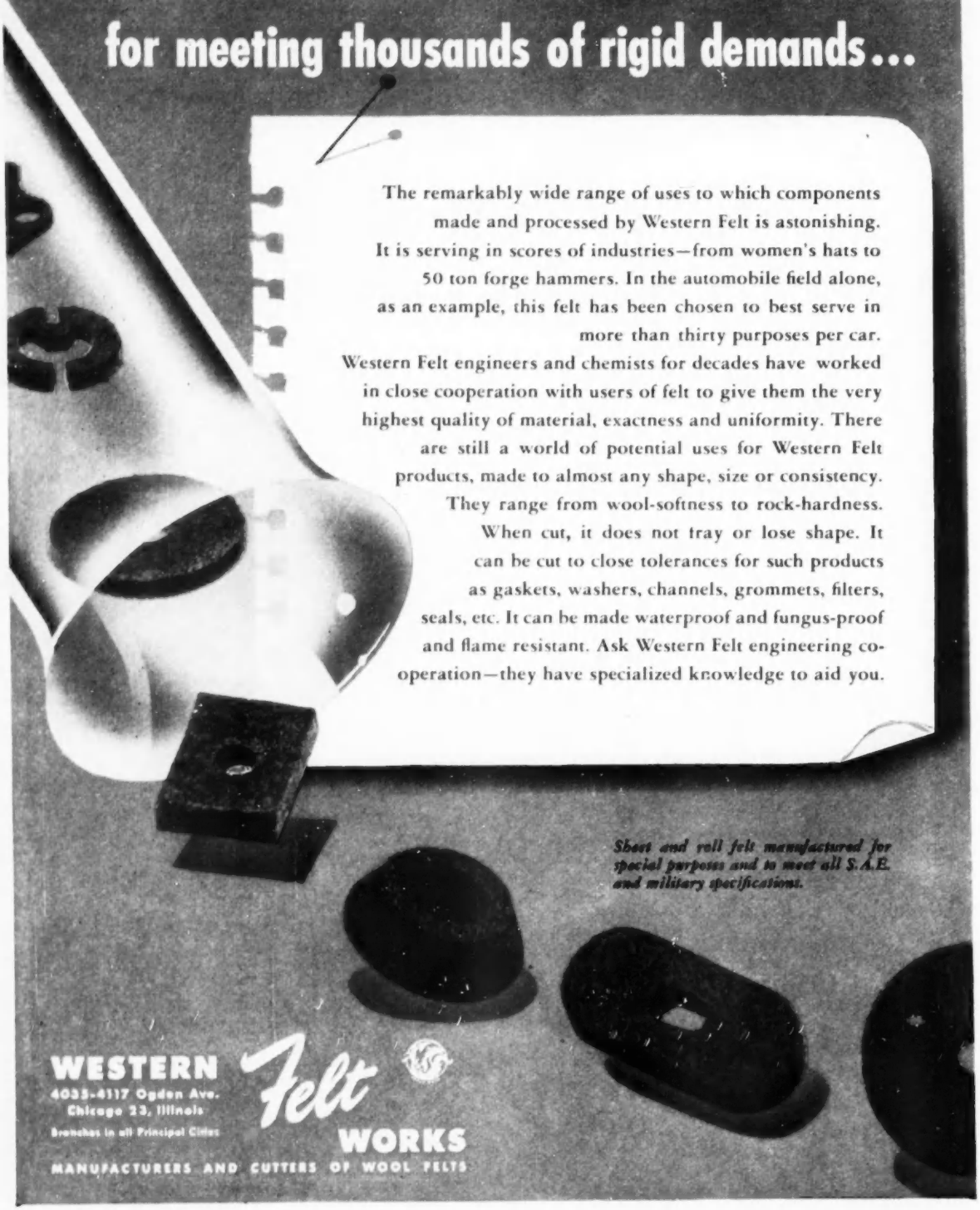
When cut, it does not fray or lose shape. It can be cut to close tolerances for such products as gaskets, washers, channels, grommets, filters, seals, etc. It can be made waterproof and fungus-proof and flame resistant. Ask Western Felt engineering co-operation—they have specialized knowledge to aid you.



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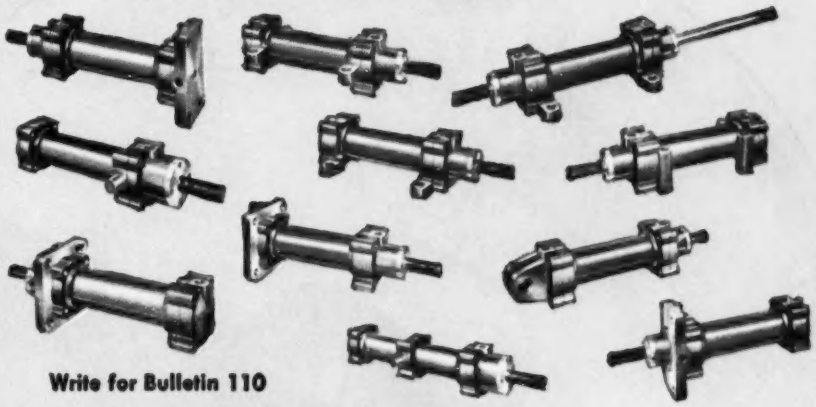

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1. Ground steel piston rod. Concentric with and locked to piston
2. Pre-adjusted chevron packings in non-adjustable gland. This eliminates over-tightening, binding, etc.
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4. Seamless steel cylinder. Extra strength. Piloted to end caps to assure concentric assembly
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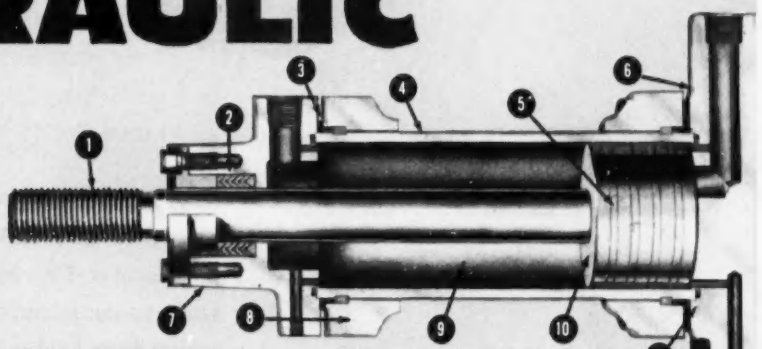
6. Alloy iron Universal end caps. Rugged. Port completely rotatable—air vents four sides
7. Cushioned caps when specified. Eliminate shock at end of stroke



8. Alloy iron Universal collars. Removable, replaceable. Permit exact positioning of foot-type mountings
9. "TRU-BORED" perfectly straight and round, then honed satin smooth
10. Cast iron piston. Grooves precision cut for superior seal. Piston concentric with and locked to piston rod
11. Confined "O" ring gaskets—seal positively, cannot extrude

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Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

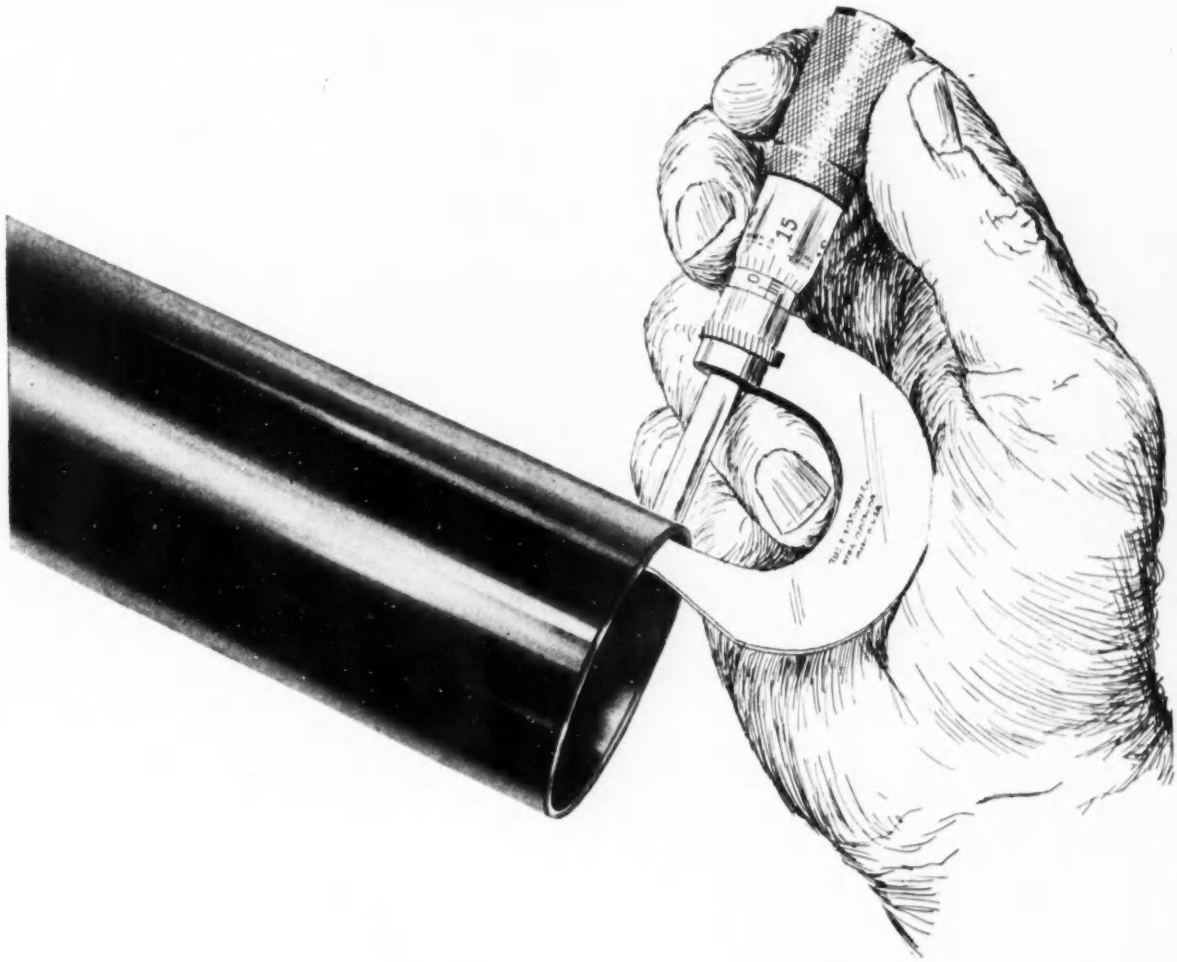
Action speaks better

MATERIAL—ALUMINUM: Hole drilled with 1" and 1 9/16" dia. drills to 1½" depth, and tapped to ¾" depth.

	HSS	CARBIDE
Cycle Time	90 secs.	**11 secs.**
Work Spindle Speed	270 R.P.M. at 104 S.F.	**830 R.P.M. at 320 S.F.**
Tool Wear	5,000 pcs. per grind	**20,000 pcs. per grind**

Conomatic}

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



It has to be accurate ...it's welded tubing

• Since welded tubing is formed from flat strip, the wall thickness must be uniform throughout. This advantage is so well recognized that tolerances for wall eccentricity are not commonly included in specifications.

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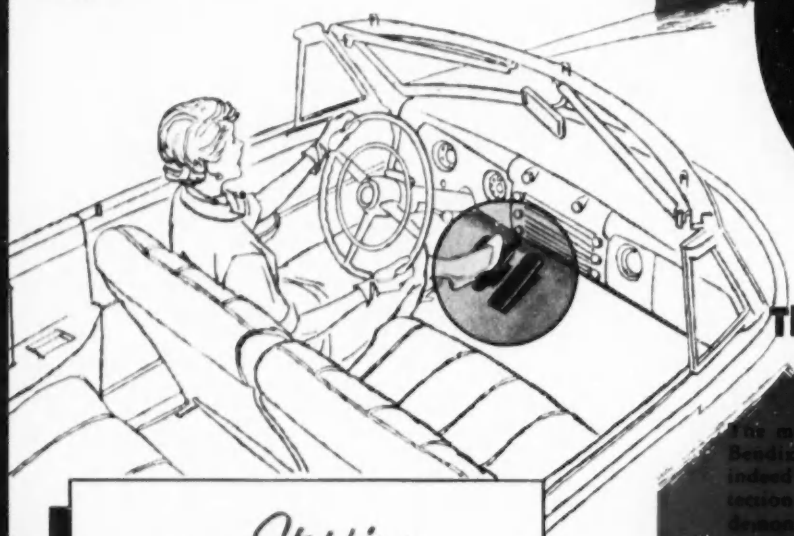
STOPS STARTS

with BENDIX Low Pedal Power Brakes you with a big Sales Advantage



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The moment a prospect steps into a car equipped with a Bendix® Low Pedal Power Brake, he recognizes that here indeed is a new car feature that will provide maximum protection from today's driving hazards. After even the shortest demonstration drive, the effortless, quick and powerful action of the Bendix Low Pedal Power Brake proves to be a new and thrilling experience in motor car control.

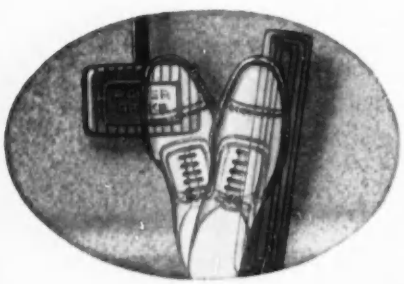
That's why STOPS with Bendix Low Pedal Power Brakes—STARTS car manufacturers with a big sales advantage.

This greatest improvement in braking since four-wheel brakes is unique in many ways. It is, for example, the only low pedal power brake that has met the test of millions of miles under all operating conditions. In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. Remember, too, this new low pedal power brake is the product of Bendix—world's largest producer of power brakes and leader in braking developments since the earliest days of the industry.

Take advantage of today's trend toward "power" operation by equipping your cars with the performance proven Bendix Low Pedal Power Brake.

*Pat. No. 2,127,497

NOW *Stopping* IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result! MORE DRIVING COMFORT, LESS FATIGUE AND GREATER SAFETY

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High Spots of This Issue

NEWS of legislative and other activities in the nation's capital which affect the automotive and aviation industries is found in a new column "On Our Washington Wire." It is presented on page 134 of this particular issue.

★ Design Problems of Large Aluminum Forgings

Weight reduction is a powerful enticement in stimulating the use of sizable aluminum forgings. Design problems do arise, however, so the author presents several configurations which have been used for desired thickness at low cost. Page 32.

★ Research Findings on Brazing and Soldering Titanium

One of the foremost of the "wonder" metals, titanium has been the object of considerable study from the brazing and soldering point of view. The way in which a North American Aviation research group tackled the problem is featured here. Page 34.

★ Scrap Disposal by Automation

No visible horizons are in sight for the seemingly infinite number of uses to which automation is being and can be put. This article relates how Fisher Body has adapted this valued production tool to the disposal of scrap metal. Page 38.

★ Air Starters for Commercial Vehicles

The installation of air starting systems in trucks and buses is a relatively new development that appears to offer several advantages to fleet operators. The origins and growth of this type of starting system are traced in detail here. Page 48.

★ Unique Engineering Features of Small French Car

This is the story of an automobile distinguished neither by speed nor style, but rather by economy in every turn of the wheels. The author shows how this theme is carried out in the small Citroen from bumper to bumper. Page 54.

★ 36 New Product Items And Other High Spots, Such As:

Novel Diesel burns wide range of fuels; styling in the crystal ball; $35 billion more available for defense; fast roll-spot technique doubles welding speeds; importance of SAE brake fluids; and developments in sub-zero engine starting.

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 109, No. 4 **August 15, 1953**

Sales Record Set in First Half

Factory sales of passenger cars from U. S. plants reached 3,239,569 units in the first six months of 1953, highest first-half year total on record, the Automobile Manufacturers Association announced.

The previous first-half record of 3,098,858 was established in 1951. The 1953 passenger-car figure ranks second only to the all-time mark of 3,571,661 sold by U. S. factories in the final six months of 1950, the AMA said. The comparable total in 1952 was 2,199,591.

Total motor vehicle sales for the first six months reached 3,877,869 units, third highest on record. They included 636,728 trucks and 1,572 buses. The total was more than a million units ahead of the 2,845,811 vehicles sold in the like period last year.

GM, Euclid Stock Deal

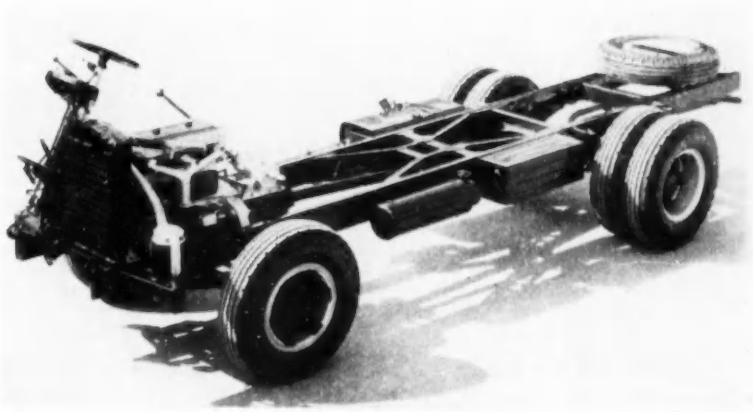
General Motors Corp. has authorized an exchange of GM common stock for all the outstanding preferred and Class A stock of Euclid Road Machinery Co., manufacturer of heavy, off-the-road vehicles.

Basis of the exchange is one-half share of GM common for each share of Euclid preferred and 7.9 shares of GM common for each share of Euclid Class A stock. The deal must be approved by Euclid stockholders.

Inventory Time Again

Beginning Aug. 3, some 100,000 automobile hourly rated workers in the Detroit area were idled for plant inventories.

Packard laid off about 15,000 for one week. Plans for its usual September closing were changed by the effect on Briggs of the earlier-than-usual Chrysler inventory period. Budd Co. also is affected by the Chrysler closing. At Kenosha, Wis., Nash will stay down until after inventory and vacations, through Aug. 28.



LARGER ITALIAN LORRY

The Super Taurus 400/60 truck is designed for up to six ton loads. A 90-hp four-cyl Diesel engine drives an eight-speed transmission with a pneumatic preselector for high and low range. Total weight is about four tons.

Los Angeles Area Employment Rises

Plants in the Los Angeles area producing automobiles, trucks, trailers, and motor vehicle parts and accessories have shown marked increases in employment during the past year. The total number of employees in the industry increased from 14,500 in early 1952 to 22,200 during April and May of this year—a gain of 53 per cent.

For some time, the Los Angeles area has ranked second only to Detroit in the assembly of motor vehicles. Fourteen different makes of passenger cars are currently assembled in the Los Angeles area: Chrysler, De Soto, Dodge, Plymouth, Buick, Oldsmobile, Pontiac, Chevrolet, Lincoln, Mercury, Ford, Nash, Studebaker, and Willys.

Record Number on Ford Rolls

Ford Motor Co. employment in the U. S. reached an all-time high during July, and manufacturing schedules for the second half of 1953 are set to exceed first-half production, according to Ernest R. Breech, executive vice-president. The new peak of 193,874 persons compares with the previous high of 191,863 in September, 1943.

In the first half of 1953, the company produced 658,000 cars and 128,000 trucks.

New Front End for Ford

Ford passenger cars will use the Thompson Products ball joint front suspension for 1954, as now used on the Lincoln. Recent reports indicate this will be the major chassis change in addition to the scheduled overhead valve V-8 engine. Company spokesmen also indicated Lincoln will bring back its prestige Continental name, probably for 1955. No design details have been released as yet.

News of the AUTOMOTIVE

HEAVY-DUTY ROAD TRAIN FOR AUSTRALIA

Two British Thornycroft tractors will be used to handle electric power units. The tractors are powered by 250-hp Diesel engines, have power-assisted clutch operation, steering, and braking. The two cabs are connected by intercom. Total weight is 223 tons with a 100-ton load on the trailer.

Rambler Sedan Ready

Tooling for the Nash Rambler four-door sedan is said to be completed. The new body style will be built on a 108-in. wheelbase. The present Rambler models have a 100-in. wheelbase. The recently announced NKI sport car, which will be built in England, is still scheduled for introduction early in 1954.

Lighter Jeep Tested

A righthand-drive Jeep is under development for the U. S. Post Office Dept. The two-wheel-drive vehicle will have an aluminum and plastic cab, with special features for handling mail. A standard left-side steering version with two-wheel drive will be added to the Willys Jeep line shortly.

Ford Shows Army Truck

Prototype military vehicles developed by Ford Motor Co. engineers were shown to Ordnance officers recently. Ford obtained a development contract a year ago to design, develop and produce experimental ¼-ton military vehicles. No details of the design have been released.

Ford to UN

Henry Ford II has accepted his first major government job as an alternate U. S. delegate to the UN General Assembly. He was appointed by President Eisenhower and is expected to be confirmed by the Senate.

King Celebrates 25th Anniversary

H. A. King Co. is now celebrating its 25th anniversary. It serves the automotive and allied industries with rubber parts and engineering service in all phases of engine mountings, torsional vibration analysis, vibration dampers and functional mechanical rubber parts.

GM Sets Record in Quarter Sales

Unit sales of General Motors cars and trucks reached a three months record high in the second quarter of $2,894 million. Net income amounted to $162 million.

Sales of passenger cars produced in the U. S. in the second quarter were 63 per cent above the same period last year. Six months sales of passenger cars produced in the U. S. were 65 per cent higher. Six months truck sales were 22 per cent ahead of last year.

Sales for the first six months of 1953 amounted to $5,441 million and net income was $313 million, equivalent to $3.51 per share.

Some NBS Functions Go to Defense Dept.

Weapons testing and development work now performed by the National Bureau of Standards is to become a Defense Dept. function. The planned move will affect four of the Bureau's 17 technical divisions, including staff and facilities.

The move is intended to strengthen the Bureau's basic program. Those divisions scheduled to move are: Ordnance Development; Electro-Mechanical Ordnance; Electronic Ordnance; and Missile Development. It is planned that the last-named operation will become a Navy responsibility.

Tool Storage Plans Told by Ordnance Dept.

Further details of the mothballing program for Ordnance production tools were announced recently by the Ordnance Tank-Automotive Center at Detroit. Government-owned machine tools valued at $425 million, and special tooling worth $190 million, will be stored in 80 packages throughout the country. About $80 million of this total is World War II tooling.

Where these machine tools cannot be utilized on a lease basis by their present civilian operators, they will be stored in Ordnance warehouses. Cost of preserving this $615 million worth of tools is estimated at $42.5 million.

At the Ford Livonia, Mich., tank plant, for instance, Ordnance will build a double walled steel 300,000 sq ft warehouse near the factory. Some 1200 machine tools and tooling valued at $35 million will be stored in the dehumidified building at a cost of $100,000 yearly. Time to return to full production is estimated as one-half that originally needed.

The plan, according to Brig. Gen. C. H. Deitrich, is to leave as many tools as possible in use on civilian production, or in place either in government or civilian plants. Outside storage or shipment to depots is the last resort, he said.

AND AVIATION INDUSTRIES

Kaiser Motors Plans Strong Comeback

Plans to reopen the Willow Run plant of Kaiser Motors Corp. were revealed late last month. If negotiations for a new pact with the UAW-CIO are successful this month as expected, the firm plans to resume 1953 Kaiser production.

Starting employment was estimated at 3000 hourly rated and 1000 salary workers. Since closing down in June about 800 workers have remained on stamping subcontracts and other automobile work, and 3000 remain finishing aircraft contracts.

Consolidation plans are well along. At Toledo, accounting, treasury and export functions are fully integrated. Purchasing and parts and accessories functions remain to be integrated. Engineering will be divided, with research, development and experimental engineering departments at Willow Run, and manufacturing and production engineering at Toledo. Willow Run will become a manufacturing center, as many outside operations eventually will be brought into the plant.

The newly formed Kaiser-Willys Sales Div. will distribute passenger cars and commercial vehicles. The distributor-dealer plan, which had been used extensively by Kaiser but not by Willys, will be followed. The present 2300 Kaiser and 2100 Willys dealers, over 600 of which are dualed with other lines, will be offered various combinations of joint franchises, to handle part or all of both lines. A new sales division, under Roy Abernethy, formerly with Packard, will be supported by separate advertising departments and agencies. The aim is for about 3200 dealers in the future.

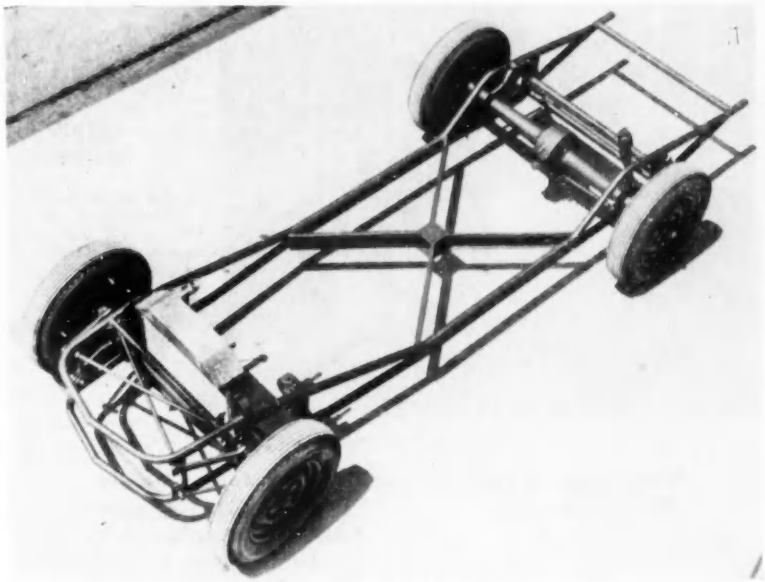
Automatic Car Control is Visualized Soon

Automatic control of automobiles on the highways may not be too far off. Dr. V. K. Zworykin, television and electronic scientist of the Radio Corp. of America, recently outlined a series of experiments already under way to guide automobiles electronically.

Possible, Dr. Zworykin said, would be such accomplishments as: Keeping a car along its prescribed route; stopping it when something gets in the way; and turning out of its original lane to pass another car moving at a slower speed.

He went on to say that equipment should be provided to enable the driver to keep his vehicle centered on the traffic lane under conditions of fog and poor visibility in general. This may be accomplished by a cable, buried in the concrete, carrying moderate-frequency alternating currents and a pair of magnetic pickups mounted on the car.

The difference in the signals derived from the two pickups may be used either to indicate the off-course position of the vehicle on the dashboard or applied directly to the steering mechanism so as to maintain the car in the center of the lane.



PRODUCTION SPORT CAR CHASSIS

This is the 500KK tubular chassis recently introduced by Frank Kurtis. Patterned after the winning Indianapolis chassis, the 100-in. wheelbase chassis has x-channel cross members, Kurtis straight front axle, Gemmer steering gear, 11 in. brakes, 6.00 x 16 wheels, 50/50 aircraft tubular shocks, custom radiator, and torsion bar suspension. Weight is 300 lb, price is $1290 complete or $399 for the frame alone.

Warrant Rate Up

General Motors Corp. has increased allowances to its dealers for warranty and policy work performed on new passenger cars and trucks, effective July 1.

On vehicles sold and serviced by the same dealer the new rate for labor will be 65 per cent. The former rate was 50 per cent. For parts and accessories the allowance is increased from dealer cost to dealer cost plus 10 per cent.

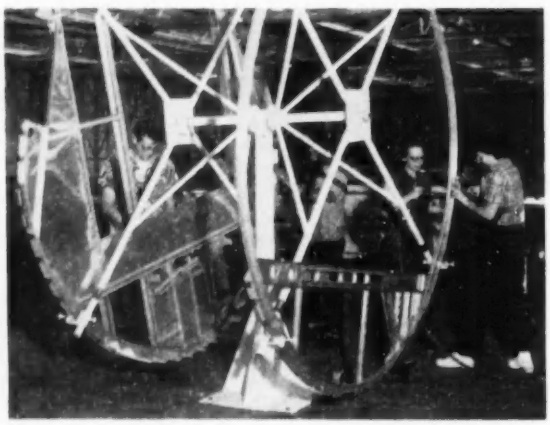
On vehicles sold by one GM dealer and serviced by another GM dealer handling the same car or truck line (tourist vehicles), the rate for labor will be 100 per cent. The former rate was 90 per cent. The allowance for parts and accessories is list price less 25 per cent.

I-H Truck Bid Wins

After Jan. 1, 1954, International Harvester Co. will be the sole army supplier of five-ton trucks. Other bidders were Mack and Diamond T.

Selection of the companies that will produce 2½ ton trucks and M-48 tanks had not been announced at press time.

News of the AUTOMOTIVE



FERRIS WHEEL

This vertical fixture for assembling Convair-Liner 340 belt frames makes it possible to turn the unit to convenient positions.

Alcoa Jumps Prices After Wage Hike

Aluminum Company of America has increased the price of aluminum ingots by from ½ to one cent a lb. The increases are ½ cent on 99 per cent minimum average aluminum pig and one cent on 99 per cent plus basic ingot, raising the prices to 20 cents and 20½ cents a lb respectively. Prices on other grades of ingot also were increased one-half cent a lb or more, depending on form and composition. Still further price increases are expected on other products soon. Reason for the increase was a pay raise to the company's 30,000 employes.

U. S. Rubber Co. Sues Armstrong on Patents

Another patent infringement suit has hit the tire industry. U. S. Rubber Co. has filed suit against Armstrong Rubber Co. charging infringement of two basic patents covering the structure of the protective white sidewall tire and the appearance or design of a narrow white strip which makes up the white sidewall. Armstrong denies that it has infringed any patents, either intentionally or unintentionally, and is preparing to fight the case vigorously in court. Firestone and Goodrich also are involved in a patent tussle on tubeless tires, with Goodrich charging Firestone with infringement of basic patents.

Monroe Builds

Monroe Auto Equipment Co. will build a 12,000 sq ft research and development building in Monroe, Mich. Space made available will be used for power steering production. The new building should be ready by Fall.

Six makers have placed orders for the new linkage power steering unit, according to B. D. McIntyre, president.

Dieselized Transit

Trackless trolley buses are on the way out, according to E. P. Cranshaw, of GMC Truck & Coach Div. On the occasion of their 30th Anniversary celebration Mr. Cranshaw pointed out that 20,000 Diesel transit buses have been built by GMC Truck and Coach since 1940. He said 2400 were built in 1952 and that this many or even more would be built this year.

Carbon Black Maker to Construct New Plant

Degussa, a leading German producer of carbon black, will shortly construct a new plant which will utilize American patents and technical know-how in order to help meet some of the growing European requirements.

Germany alone now requires more than 50 million lb annually. Other continental requirements are estimated at more than 150 million lb, of which about 85 per cent must be imported.

Clark Announces Fork-Lift with Torque Converter

A fork-lift truck with automatic transmission has been announced by Clark Equipment Co. The new gas-powered series in most load ranges will feature reduced maintenance requirements, smoother acceleration, and simplified controls.

The Hydratork models equipped with Long torque converters will carry only a $370 price increase, factory installed initially on the 6-7000 lb. range. Clark announced that in some applications five automatic transmission fork lifts would do the work of seven ordinary trucks. A one-piece automotive-type main drive shaft-gear is in constant mesh with a primary forward and primary reverse countershaft gear. Secondary forward and reverse gears in constant mesh are hydraulically selected and connected with one control through five clutch-type discs each.

Defense Dept. Publishes Revised Suppliers List

A newly-published supplement to the Federal Supply Code for Manufacturers presents about 7200 listings of firms now assigned code numbers by the Defense Supply Management Agency's Office of Cataloging.

The first revision to the basic listing of November, 1951, the new supplement lists new firms, revisions of earlier listings, corrections, and deletions. Copies of the revision are on sale at the Government Printing Office, Washington 25, D. C., for $1.25

Goodrich Expanding Plant at Oaks, Pa.

A $9 million expansion at the B. F. Goodrich Co. tire and tube manufacturing plant in Oaks, Pa., has been announced. The expansion is scheduled for completion in late 1954.

New Le Roi Div.

Le Roi Co. has announced the formation of a new division for the manufacture of front end loaders and truck mounted mixers. It will be known as the Le Roi-Transo Division.

AND AVIATION INDUSTRIES

Hiller and Doman Sign Agreement

In a joint release, Hiller Helicopters and Doman Helicopters, Inc., recently announced the signing of a license agreement for the production by Hiller of the YH-31 military helicopter. Under development for the past several years, the YH-31 is now undergoing CAA tests at the Doman plant, prior to delivery of several units to the Army.

Canadian Sabre Orders

The Canadian Government has ordered another 120 Sabre jet fighters from Canadair and all will be powered by Orenda engines built by the A. V. Roe Co., at Toronto.

Canadair President J. G. Notman said the Orenda-driven Sabres would be known as the Mark II F-86E. He released no figures but the contract was believed to be worth $40 million.

A "classified" label kept production figures under lock and key. But it was believed that the Government's original order for the RCAF had been for 500 planes. The Royal Air Force was reported to have ordered another 500 of the jets.

Aeroquip Acquires Sterling Plant

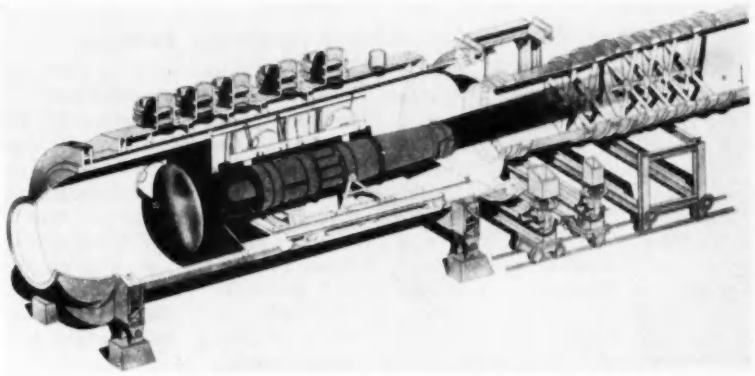
Pressed by the need for additional operating facilities and storage space, Aeroquip Corp. has acquired the plant of Sterling Electric Motors, Inc., located at Van Wert, O. The plant contains 45,000 sq ft of space.

Aircraft Metal, Aero-Cal Merge with Coast Pro-Seal

Aircraft Metal Forming Co., Inc., Burbank, Calif., and Aero-Cal Engineers, Inc., also of Burbank, have merged with Coast Pro-Seal & Manufacturing Co., Los Angeles, which changed its name recently from Coast Paint & Chemical Co.

Dodge is 75

The Dodge Manufacturing Corp., power transmission machinery builders, commemorated the 75th anniversary of the firm's founding recently.



TURBOJET TEST CHAMBER AT AEDC

At the Arnold Engineering Development Center, Tullahoma, Tenn., the engine test facility includes this test chamber for turbojet engines. Components include refrigeration drying equipment, compressors, three test chambers, and a test bed.

A civic testimonial luncheon was given at Mishawaka, Wis., June 15, followed by a plant open house two days later.

The earliest development with detachable bushings was the wood split pulley patented by Wallace Dodge, the company's founder, in 1882. Then followed iron split pulleys which later gave way to steel. The bushing principle was also applied to two types of Dodge-Timken pillow blocks and to Torque-Arm speed reducers.

Another stride forward in bushed products was the development of the Taper-Lock principle now being used successfully in conveyor pulleys, shaft couplings and v-belt sheaves. The most recent advancement is the Taper-Lock sprocket with Dodge roller chain.

Hall-Scott Div. Awarded Marine Engine Contract

Hall-Scott Motor Div. of ACF-Brill Motors Co. has been awarded a $1.25 million order for marine engines by the Navy. The engines will be of the water-cooled, V-12 type.

Alten Foundry Buys Ideco Pump Line

Alten Foundry & Machine Works has announced the purchase of the Ideco pumping unit line from the Dresser Industries. Although this acquisition expands Alten's activity in the petroleum equipment field, it is not retiring from the contract manufacturing field.

Alcoa Plant Cuts Magnesium Output

The Aluminum Co. of America's magnesium foundry at Buffalo, N. Y., has laid off about 100 workers and reduced operations from three to two shifts largely because of "the order stretchout in the aircraft industry." The production cutback is the plant's first in more than three years. Most of the stretchout has come from about six major customers making aircraft engines, landing gear and similar items. Nearly all of the plant's output of magnesium castings is for the aircraft industry on a subcontract basis.

Buda Road Show

More than 300 business and industry executives along with representatives of the press saw the Buda Co., Harvey, Ill., open the nationwide tour of its "Buda Magic" show in Chicago July 15 with a theatrical demonstration which combined glamor and entertainment in a dramatic showing of the new features of Buda's FT fork lift trucks.

Buda distributors in all principal cities will see the show on tour. The road show performances will be simplified, however, and will concentrate on demonstrations of the trucks by Buda and distributor representatives. A sales and service school is also planned for each distributor.

News of the AUTOMOTIVE

GM Diesel Equipment in Ring Business

From now on Detroit Diesel Engine Div. "71" series engines will be fitted with "Lite-Tite" hard-chrome-faced steel compression rings, supplied by the Diesel Equipment Div., General Motors Corp. That puts GM in the piston ring business for the first time. These rings now are in production at Grand Rapids and will be used exclusively in production and service on Series 71 Diesel engines, including service on all previous models.

Crosley Continues Engine Production

Although the Crosley automobile has not been produced for more than a year, production of engines for industrial use continues at Cincinnati. The 26 hp engines are being built at the Aerojet-General plant there at the rate of 1000 units a month. Aerojet-General is a subsidiary of General Tire and Rubber Co. which holds a large stock interest in Crosley Motors. Most of the engines are being supplied to the armed forces for powered generator sets, with the balance going into industrial applications such as material handling trucks.

Parker Realigns

Parker Appliance Co. of Cleveland, manufacturer of aircraft fuel and hydraulic systems components, announces the consolidation on the West Coast of all its aircraft activity, exclusive of jet engine accessories.

Heretofore, nearly 40 per cent of Parker's production of valves and accessories designed for aviation fuel and hydraulic systems has been in Cleveland, where the aircraft sales and engineering headquarters have been located.

Parker Aircraft Co. of Los Angeles will take over all of the engineering, production, and sales activities of these aviation products. However, the Engine Accessories Div. of Parker Appliance, which manufactures jet engine components, will continue to function in Cleveland because of its proximity to the locations of principal engine manufacturers.

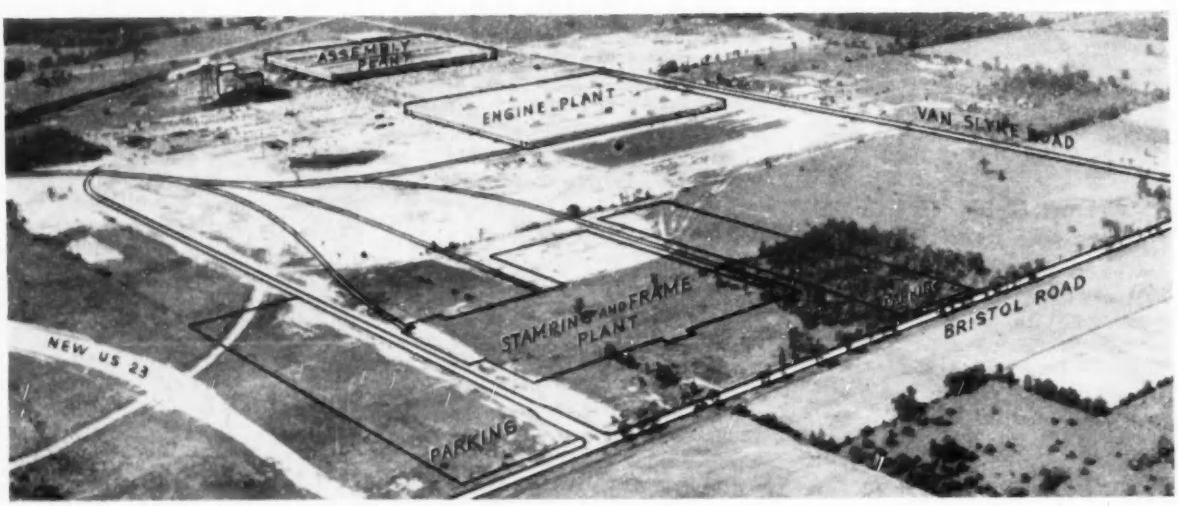
Operations of another subsidiary, Synthetic Rubber Products Co. of Los Angeles are being merged with those of Parker's Rubber Products Div. Henceforth, the Los Angeles facility will be known as the Rubber Products Div., Parker Appliance Co., 1538 S. Eastern Ave., Los Angeles.

Titanium Laboratory Dedicated at M-S

An industrial laboratory to be devoted exclusively to research and development on titanium was formally opened at Niles, O., last month by Mallory-Sharon Titanium Corp. The firm also has announced the development of a new melting process which produces homogeneous ingots with controlled carbon content and, in addition, increases the "yield" of metallic titanium from its sponge raw material, now in critical short supply. The new process, called method "S," combines the best features of the two older methods.

The new laboratory will be devoted to basic research, development of titanium and titanium alloys, and production testing. It will include a complete chemical laboratory, metallographic and spectrographic equipment, mills for hot rolling test specimens, furnaces for heat treating and melting, and an x-ray diffraction unit, in addition to normal laboratory test equipment.

Completion of the new laboratory permits Mallory-Sharon to concentrate all its activities at one location. Laboratories were in Indianapolis,



HOW THE CHEVROLET FRAME PLANT FITS IN

This aerial view shows the location of the new Chevrolet frame plant to be built at Flint, Mich.

Ind., where P. R. Mallory is located. The company's facilities at Niles now include the laboratory, a complete melting shop and the extensive rolling and fabricating facilities of the Niles Rolling Mill, a division of Sharon Steel Corp. Mallory-Sharon manufactures titanium and titanium alloys in the form of sheets, strip, plates and other flat rolled products, as well as rods, hexagonals and forgings.

More Light Castings

Dollin Corp., Irvington, N. J., producer of zinc and aluminum die-castings, recently broke ground for an addition to their plant that will provide a 60 to 75 per cent increase in total production capacity.

This expansion, which is expected to be completed by September, will include adding die-casting machines of the large cold chamber type, high pressure machines for aluminum castings; large plunger type machines for large zinc castings; and special high-speed automatic machines for small zinc castings (in the approximate range of 3 per pound to 1000 per pound).

Rod Mill Expands

A major step in modernizing and expanding production facilities of American Steel & Wire Div. of U. S. Steel Corp. in Cleveland has been revealed. The new facilities, which will include a combination rod mill, billet storage areas, and rod storage areas, will have a rated capacity of 450,000 tons per year compared to the present equipment which dates back to 1916 and has a rated capacity of 313,000 tons a year.

Cessna Belt-Driven

Propeller V-belt drive has been used successfully on a Cessna 170 to reduce engine noise and vibration and increase airplane performance. It was developed by Cessna Aircraft Co., Goodyear Tire and Rubber Co., Continental Motors Corp. and the McCauley Propeller Co.

First step in developing the unusual drive arrangement was to install the V-belt system on a C-145 series four Continental engine, standard equipment on the Cessna 170. At the completion of tests, a CAA Type certificate was issued to Continental Motors.

The modified McCauley propeller was 92 in. in diameter and has a 70-deg pitch which is considerably greater than that of propellers used on standard Cessnas.

The eight synthetic fiber V-belts now in use in this arrangement are ⅝ in. wide, 7/16 in. deep and 41 in. long. The multi-groove propeller pulley is nine in. in diameter while the driver pulley is six in. in diameter. Belt tension is maintained by a simple adjustment mechanism which allows the propeller to be moved in relation to the crankshaft pulley.

The joint participants in the project have agreed that a specific engine and propeller should be built to utilize the V-belt drive.

FASTER FORGINGS

Bulk forgings are shoveled at Detroit Gear Div. of Borg - Warner Corp. at a 90 per cent saving in man hours over previous method. The Clark 4000 lb capacity truck is fitted with an Allen shovel.

Rigidized Distributor

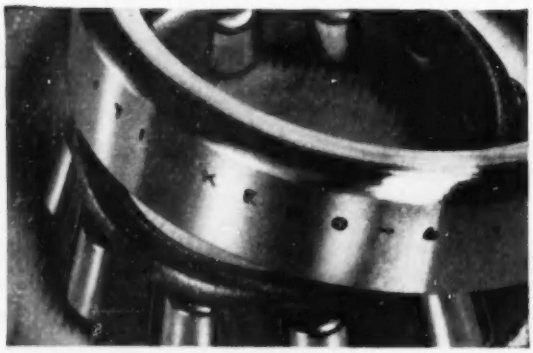
Chicago Steel Service, Kildare Avenue and 45th Street, Chicago, Ill., has been appointed distributor for Rigidized Metals Corp. The latter manufactures three-dimensional, design-strengthened Rigid-Tex metal.

Continued on Page 82

1953 U. S. PASSENGER CAR PRODUCTION

(As reported by the car factories)

	July 1953	June 1953	July 1952	Seven Months 1953	Seven Months 1952
Chrysler	13,533	19,043	4,957	114,797	72,004
De Soto	12,107	13,904	3,515	86,080	54,577
Dodge	21,458	33,505	6,820	203,701	140,617
Plymouth	69,797	66,750	15,091	410,929	289,162
Total—Chrysler Group	116,895	133,202	32,383	815,507	526,560
Ford	124,899	91,453	25,084	629,605	387,363
Lincoln	4,407	5,553	3,241	32,358	18,721
Mercury	35,966	21,963	9,937	161,245	98,130
Total—Ford Group	165,272	118,969	38,262	823,208	504,214
Buick	45,678	52,738	13,556	322,833	182,628
Cadillac	11,000	11,008	7,561	73,851	54,639
Chevrolet	139,459	144,665	21,932	913,721	483,884
Oldsmobile	36,626	38,202	9,283	233,400	128,462
Pontiac	42,199	44,629	12,384	272,639	154,633
Total—G. M. Group	274,964	291,442	64,716	1,816,444	1,004,446
Kaiser Motors Group	242	1,211	6,222	19,804	38,943
Hudson	3,553	6,190	7,069	53,702	48,245
Nash	1,056	14,031	3,975	107,343	72,380
Packard	7,154	9,161	2,348	67,077	35,636
Studebaker	21,956	14,338	2,901	119,083	92,125
Willys	5,664	None	1,748	30,530	27,781
Total—All Makes	586,758	583,544	159,624	3,852,698	2,350,280



THE NUMBER 5BC-6 quickly tells you this is a tapered roller bearing used on steering gears. When it's a *Timken*® bearing number, it also speaks volumes about quality and service—and how they pay off in your car's moving parts—the "vital zone"...

One number that speaks volumes

HE HEARS TEN-THOUSANDTHS OF AN INCH—At this electronic gage, blind Simon Hisrich performs one of 125 inspections made on Timken bearings—the most accurate car parts you buy. He inspects the OD of outer races by listening to a buzz: one pitch for okay, another for reject.

BEARINGS BY THE TON—Here are a few of the 5,850 sizes and 26 types of Timken tapered roller bearings. Among them are the bearings to fit your needs. And we have the capacity to turn them out in any quantity.

THIS INSTRUMENT analyzes steel in 40 seconds. Results are flashed to the furnace for close control of the melt. Tighter quality control is the reason we make our own steel; no other bearing maker does. When specifying a bearing number, specify "Timken" too. And for *full* value, always use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN is number 1 for VALUE where value counts most...in the vital zone

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NOT JUST A BALL ○ NOT JUST A ROLLER ⊂ THE TIMKEN TAPERED ROLLER ⊂ BEARING TAKES RADIAL ↓ AND THRUST →|← LOADS OR ANY COMBINATION →

Men in the News

Fairchild Engine Div. — Emerson W. Conlon has joined as head of development engineering, while Alfred T. Gregory has been appointed head of research and advanced engineering.

Ford Motor Co.—**Chester M. Surdyk** has been made controller of the Buffalo assembly plant.

Seiberling Rubber Co.—**C. Sterling Parker** has succeeded **George A. Wiedemer** as manager of truck tire sales. The latter retired recently.

Bendix Aviation Corp.—**Oscar F. Haug** has been chosen project engineer for Ultra-Viscoson, new ultrasonic instrument for measuring the viscosity of fluids.

Ford Div., Ford Motor Co.—**Edwin H. Sonnecken** is now manager of consumer research.

Russell, Burdsall & Ward Bolt and Nut Co.—**Thomas Toby** has become assistant vice-president of sales, succeeding **James M. Dill**, retired.

Brush Electronics Co., Sales Div.—**J. P. Arndt, Jr.**, has been appointed assistant general sales manager in charge of staff functions. He succeeds **A. J. W. Novak**, now head of all line sales activities.

Liggett Supply & Equipment Co.—**Roger J. DeFauw** has joined the sales staff.

Kelite Products, Inc.—**A. C. Hillman** has been made a special consultant.

Hudson Motor Car Co. — **John J. Murphy** was recently appointed manager of defense projects.

Dodge Div., Chrysler Corp.—**Foster D. Ely** has become Detroit regional manager.

Eaton Mfg. Co.—M. D. Archangeli was promoted to general sales manager, Valve and Saginaw Divs.

Schnabel Co.—Lloyd Heatherington has been appointed general sales manager.

Westinghouse Electric Corp., Electronics Div.—**Robert C. Cheek** is now assistant manager of engineering.

Clevite Corp.—**Herman L. Weckler** was elected vice-president of operations.

Ford Tractor Div., Ford Motor Co.—**Thomas A. Farrell** has been elected a vice-president and general manager.

Geo. D. Roper Corp.—**F. R. Dickerson** was made vice-president and general manager of the Pump Div. Other appointments include: **C. R. Oehler**, treasurer; **L. R. Jensen**, vice-president of operations; **J. H. Makemson**, vice-president and general manager of the Appliance Div.; **E. C. Sorby**, vice-president in charge of trade and public relations; **H. D. Wiegel**, general manager of the Ordnance Div.; **C. A. Miller**, controller; and **W. F. Hinz**, assistant treasurer.

Willys Motors, Inc.—Four executives have been appointed to consolidate their respective departments at Willys and Kaiser Motors covering the recently combined automotive divisions of the two companies. They are: **George L. Palmer**, director of finance; **George J. Edellstein**, director of purchasing; **Henry C. McCaslin**, director of manufacturing-engineering; and **Marden R. Bishop**, director of public relations.

New Departure Div., GMC — Carlton B. Beckwith, advertising manager since 1931, has retired.

Champion Spark Plug Co.—Gerald E. Ledbetter is now assistant sales manager.

Hyster Co. — Jack Lewis was elected vice - president in charge of production.

(*Turn to page 90, please*)

Necrology

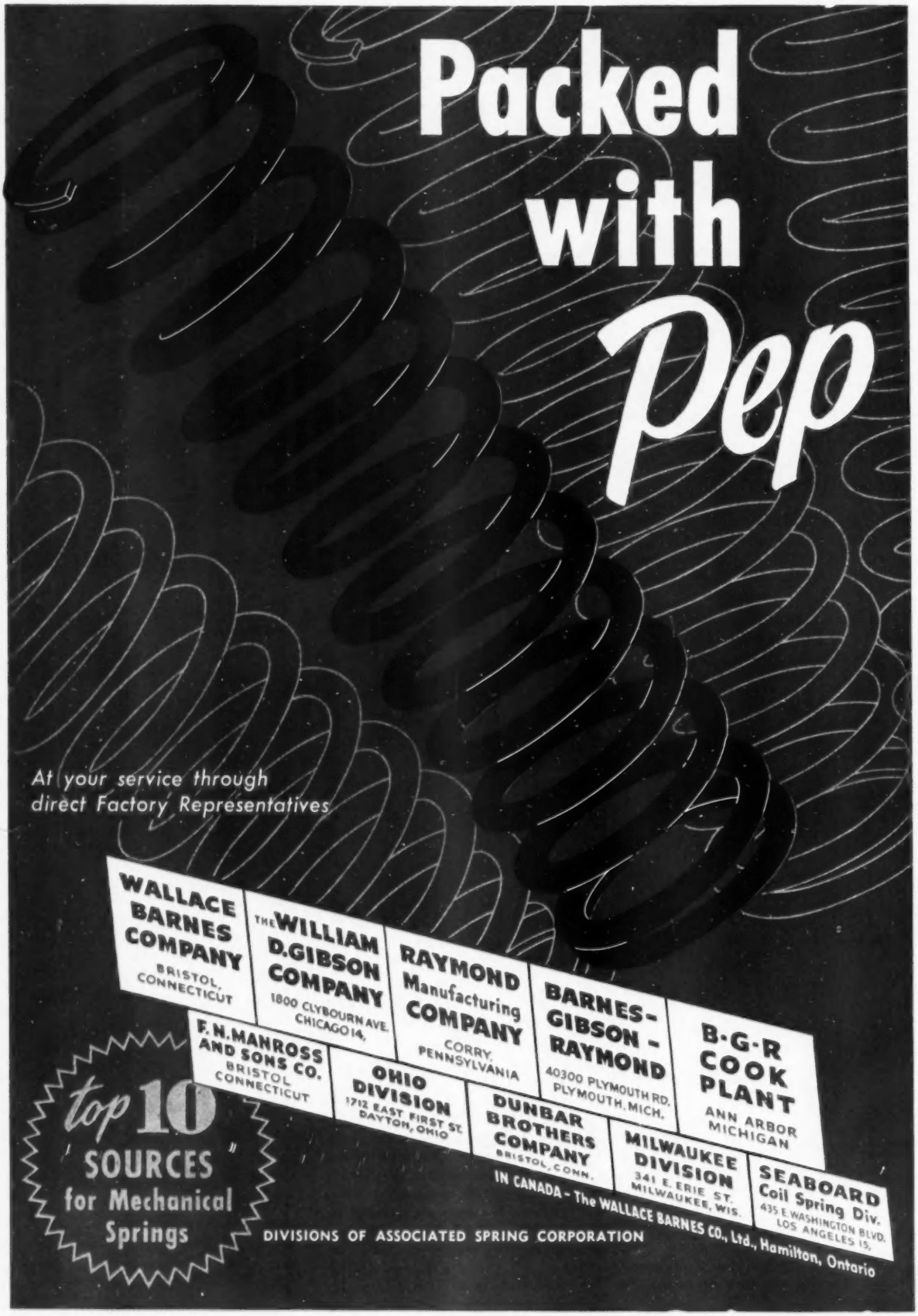
George A. Spoon, 58, vice-president of sales and engineering for Muskegon Motor Specialties Co., died July 17 at Milwaukee, Wis.

John S. Mohrhardt, pioneer in the automobile industry with Olds Motor Works, King Motor Co., Columbia Motor Car Co., and Dodge Div. of Chrysler Corp., died July 23 at Detroit, Mich.

Charles W. Abercrombie, 42, plant manager for American Sintered Alloys Div. of Yale & Towne Manufacturing Co., died July 23 at Bethel, Conn.

Joseph S. Mack, 82, last of six brothers who founded the Mack Truck Co., died July 25 at San Diego, Calif.

Frank Stephenson, manager of structural steel sales for Bethlehem Steel Corp., died July 24 at Asheville, N. C.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ANN ARBOR MICHIGAN
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DUNBAR BROTHERS COMPANY
BRISTOL, CONN.
MILWAUKEE DIVISION
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SEABOARD Coil Spring Div.
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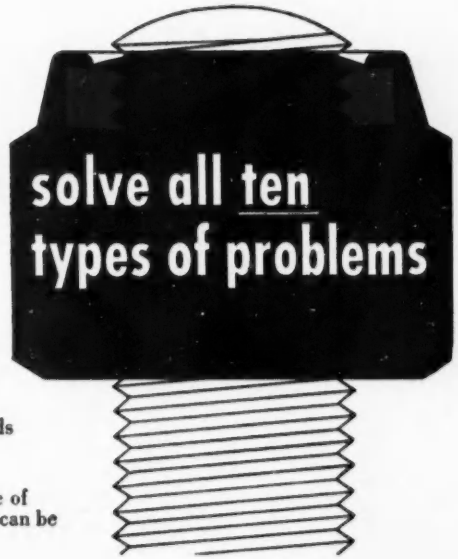
top 10 SOURCES for Mechanical Springs
DIVISIONS OF ASSOCIATED SPRING CORPORATION
IN CANADA - The WALLACE BARNES CO., Ltd., Hamilton, Ontario

elastic stop nuts solve all ten types of problems



Here are ten typical fastening problems. One device, the ELASTIC STOP nut, solves them all—without additional parts or operations. Deliberately undersized in relation to bolt diameter, the red elastic collar grips the bolt with a perfect fit, exerting a continuing self-locking pressure against the threads, and holding the nut securely in place at any point on the bolt. It also provides a tight seal against the bolt threads, which prevents seepage and wear-producing axial play. And because the bolt threads are protected against moisture from without, the nuts are not "frozen" to the bolt by corrosion.

ELASTIC STOP nuts stay tight, right where you put them, in spite of vibration and stress reversals. Yet they are not jammed in place, and can be removed with a wrench and reused many times.

For further information on ESNA self-locking fasteners, mail the coupon below.

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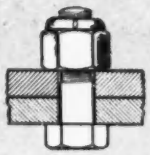
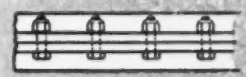


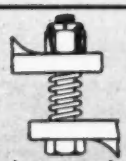
Wherever a vibration or impact proof bolted connection is desired.

On all electrical terminals subjected to vibration in transit or operation.

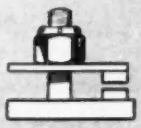


For uniform and precise prestressing of multiple bolt assemblies . . . adjusted by predetermined wrench torques.

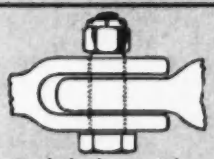
LOCATED ANYWHERE ON THE BOLT



Spring-mounted connections or dynamic balancing, where nut must stay put yet be easily adjusted.



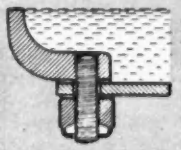
On make-and-break adjustment studs where accurate contact gaps are required.



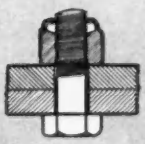
For bolted connections requiring predetermined play.

For rubber-insulated and cushion mountings where the nut must not work up or down.

FOR MANY SPECIAL APPLICATIONS



To seal bolt threads where elimination of leakage past stud threads is necessary.



To seal bolt threads where it is necessary to protect them from corroding elements.

To obtain delicate adjustments for applications such as bearing locknuts where precise adjustment is essential.

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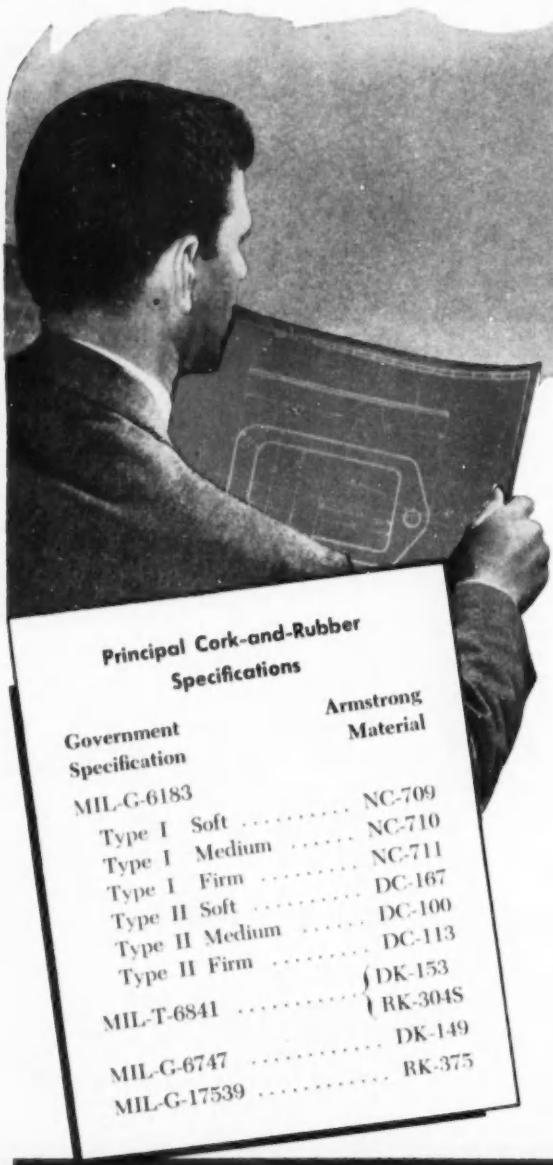

Principal Cork-and-Rubber Specifications

Government Specification	Armstrong Material
MIL-G-6183	
Type I Soft	NC-709
Type I Medium	NC-710
Type I Firm	NC-711
Type II Soft	DC-167
Type II Medium	DC-100
Type II Firm	DC-113
MIL-T-6841	DK-153 or RK-304S
MIL-G-6747	DK-149
MIL-G-17539	RK-375

"You sure? Hadn't we better check the specifications?"

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He's right. Armstrong does make a compound to meet each of the nine types covered by the principal government cork-and-rubber specifications. This means you can get the cork-and-rubber gasket material you need and get it promptly—when you call Armstrong.

Of course, you don't have to be working on a government contract to get fast service. Armstrong makes and stocks a wide variety of cork-and-rubber materials for all kinds of specialized applications.

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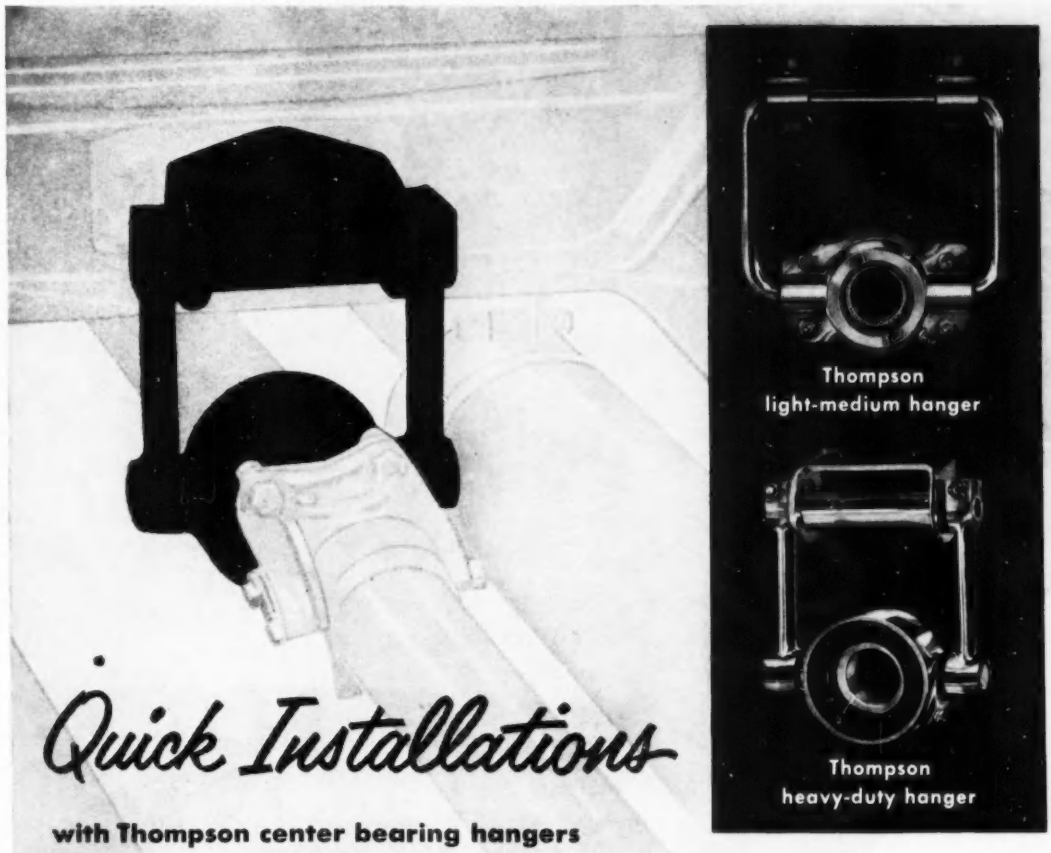
FREE! Gasket Data Book

The 24-page manual, "Armstrong's Gasket Materials," gives you information on current government specifications and tentative SAE-ASTM specifications. You'll also find helpful sections on the design and use of gaskets, covering subjects like Designing Gaskets to Reduce Costs, Practical Tolerances for Resilient Gaskets, Designing Flanges for Efficient Sealing.

For your free copy, write Armstrong Cork Company, Industrial Div., 7108 Imperial Ave., Lancaster, Penna.

Armstrong's Gasket Materials



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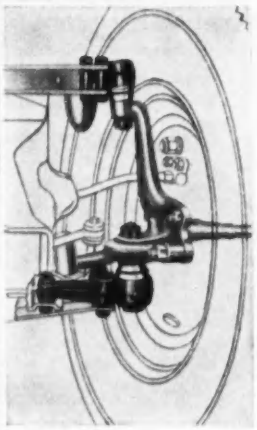

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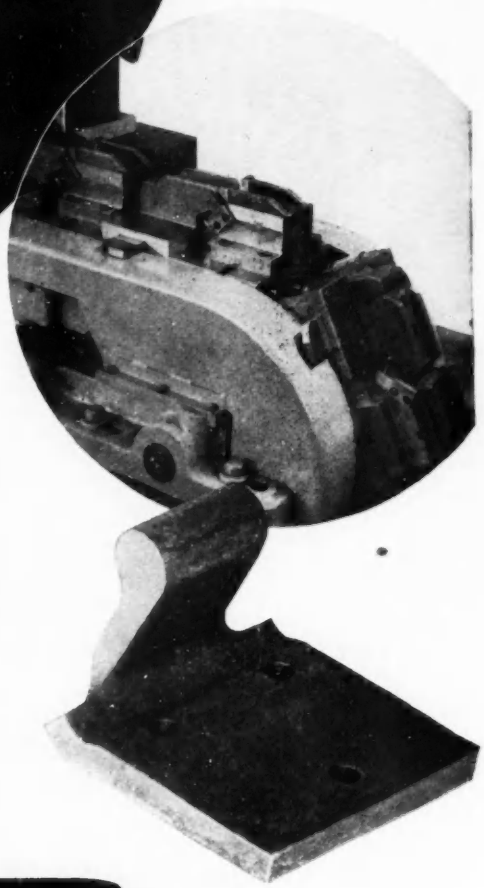
lower cost per piece . . .

with continuous surface broaching of small parts

• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



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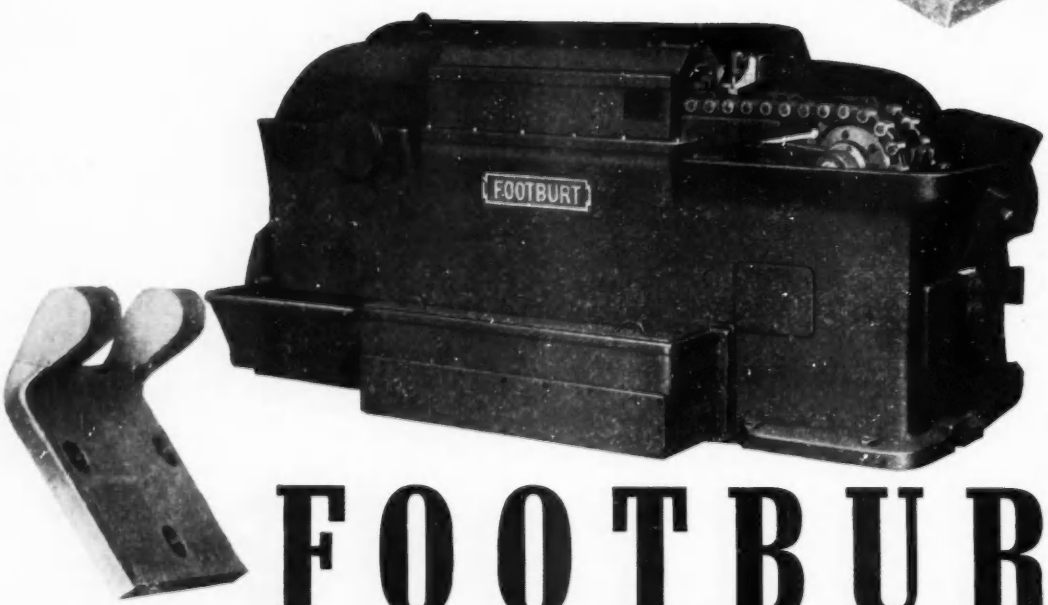

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A Victor Quality Product — in Sheets or Finished Gaskets

Base material of ASBESTOPRENE #233 is a selected long asbestos fiber. It is felted and bonded in complete homogeneity by a beater impregnation process with a new heat-and-oil resisting neoprene latex.

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TABLE I

Cost Relationships of Several Forgings Designs for Wing Bulkhead

Design Type	Total Unit Cost	Die Cost Set Up Charge & Piece Price	Machining and Tooling Cost
Fig. 4—Hand forged billet	100%	39%	61%
Fig. 3—(A) Blocker die 15,000 ton	77%	43%	57%
Fig. 3—(B) Blocker die 18,000 ton	72%	46%	54%
Fig. 2—(B) Semi-desired forging 18,000 ton	63%	61%	39%
Fig. 2—(A) Desired die forging 35,000 ton	?	?	?

By C. W. Andrews
Douglas Aircraft Co., Inc.

Design Problems of Large Aluminum Forgings

THE potential of weight reduction is one of the prime reasons for encouraging the use of large forgings. Substantial savings in weight can result from the elimination of joints and eccentricities and a more efficient disposition of material. The penalties imposed by splices in highly loaded members and the attachment of major fittings are well known. Any device which can minimize these penalties must be employed. Care must be exercised, however, to prevent weight penalties resulting from the use of the forging itself.

Attainment of maximum efficiency in strueture demands that a minimum amount of material be used and that this material work to the highest possible stress level. In beams, the web thickness should be no greater than required by the shear load. The caps should taper in area with the variation of bending moment to maintain high stress levels. The beam cap centroids must be as far removed from the neutral axis as possible to produce maximum section properties for minimum weight. These requirements have brought demands for thinner webs and smaller draft angles in die forgings. If suitable thickness and draft cannot be produced in the die forging blank, then they must be machined into the finished part. The design must recognize this condition and provide for economical reduction of thickness by machining.

Several design configurations have been used to obtain desired thickness at low cost. The channel type of design is highly recommended where it can be used. The raised pad type of design can be used where an "I" section is desired. This configuration is satisfactory, if there is zero die closure tolerance. If large closure tolerances exist, this type of design may not prove advantageous and weight control with simple minimum machining may not be possible. The system of providing punchouts is also satisfactory providing die closure tolerances can be minimized. Higher die pressures may produce thinner webs, but if die closure tolerances continue to remain at their present levels, the achievement of thinner webs will be of little value. Assuming that a five per cent weight tolerance is reasonable in an aircraft, this would require that forgings with 0.250 in. webs have a die closure tolerance of 0.0125 in. Tolerances of this magnitude may be possible but the recommendation for die closure tolerance by forging vendors on a part 1200 sq in. in area with 0.75 in. web thickness was 0.19 in. (25 per cent of the web thickness). In terms of weight, this additional material would amount to 22 lb per forging if it were not removed by machining. Areas exceeding 2000 sq in. will probably be common with the operation of 35,000 ton and 50,000 ton presses. At that time even the tolerances on machining must be carefully considered. In 2000 sq in., a tolerance of 0.03 in. increases the weight six lb. Although this tolerance may be considered reasonable by some, it is an indication of weight penalties induced even by small tolerances. Proposals to partially machine rough forgings prior to the finish die operation may alleviate the web thickness and die closure problem.

In view of the large tolerances associated with forgings, it would be foolish to use forgings where closer tolerance extrusions could be used at no penalty in strength and a possible saving in cost. Typical applications for large forgings are wing spars, heavily loaded frames, ribs and bulkheads, floor beams, gear support structure and major attach fittings. Most of these examples represent flat webbed beam or truss type of construction and lend themselves to reasonable forging production. Complex single or double contoured elements in large sizes may be possible in the new heavy presses. As the design deviates from a flat plane, however, die

machining becomes more difficult, side thrusts are induced and in general costs rise severely.

In aircraft design, two aluminum forging alloys, 14S and 75S, are generally used. The selection of one over the other can influence cost as well as strength. It is more difficult to forge 75S material and, as a result, more stage dies are required. The number of operations is increased and die life is reduced. Obviously, die cost and piece price will be higher. Conservative estimates place a 20 per cent to 30 per cent cost penalty on the use of 75S in lieu of 14S due to these factors. In some applications, 14S could be specified without penalty, particularly where rigidity requirements set the design criteria.

The relationship of the forging blank to the finished part is probably more important to cost than any other consideration. Variation in cost with forging blank design is well illustrated in the following example. Figure 1 shows a single piece wing bulkhead fabricated from a 75S forging. The area of this bulkhead is 1200 sq in. On the basis of present standards, it was felt that a refined die forging, Fig. 2, design A, would require at least a 35,000 ton press. This press was not in operation yet and deliveries could not be expected in time for production requirements. Decisions were made therefore to develop, with the aid of the forging industry, an interim design capable of being produced on existing 15,000 ton or 18,000 ton presses. Fig. 3, design A, shows the blocker type design proposed for the 15,000 ton press and Fig. 3, design B, the design for the 18,000 ton press. Further studies by the forge shop indicated that a more detailed die forging, Fig. 2, design B, might be produced on the 18,000 ton press. For immediate use, a hand forged billet, Fig. 4, was ordered. Estimates were obtained on the total cost of the material including die cost, piece price and setup charges. Similar estimates were made of the machining costs to reduce the various blanks to finished parts. The relationship of these costs is noted in Table I. The most expensive configuration, naturally, was the hand forged billet. Total unit cost of the hand forging was established as unity and the other configurations are compared to it in terms of a percentage. The relative cost of material and machining are also shown for each configuration. The significance of this comparison is that the material cost in terms of dollars remained fairly constant. The saving in total unit cost resulted primarily from reduced machining costs. Closer tolerance forgings, even at increased die costs, may prove to be the most economical over-all approach.

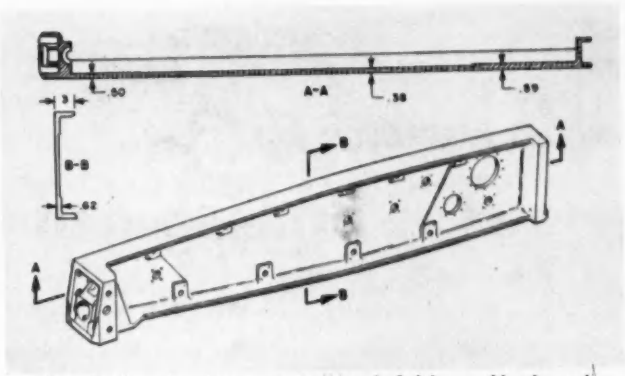

Fig. 1—Swept wing root bulkhead finish machined part weighs 88 lb.

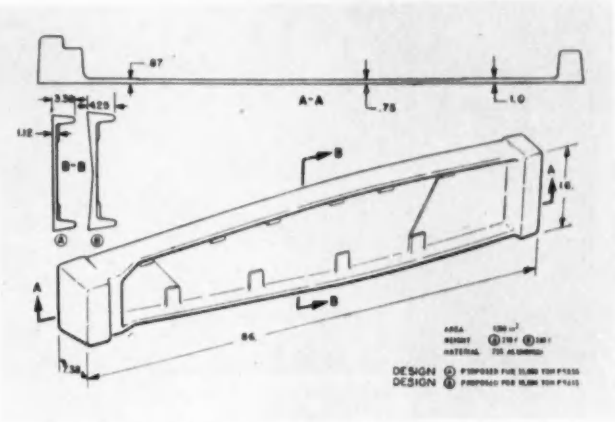

Fig. 2—Swept wing root bulkhead forging to be made on either 35,000 ton press or 18,000 ton press.

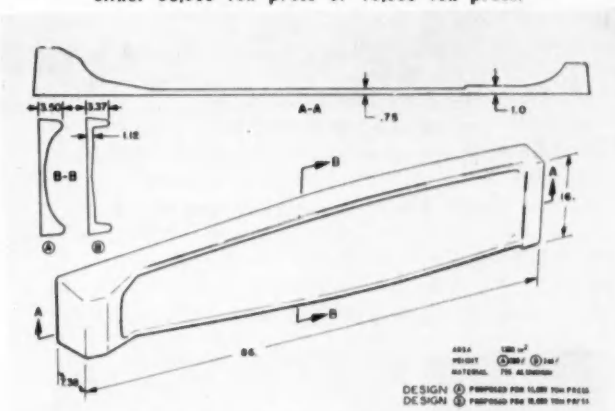

Fig. 3—Blocker type forging for the swept wing root bulkhead.

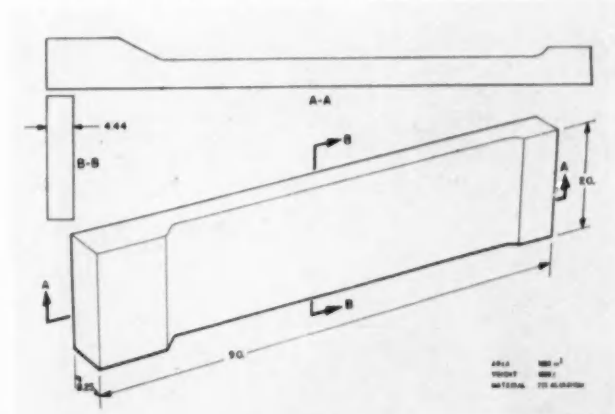

Fig. 4—Hand forged billet for the swept wing root bulkhead.

Research Findings on

Brazing and Soldering TITANIUM

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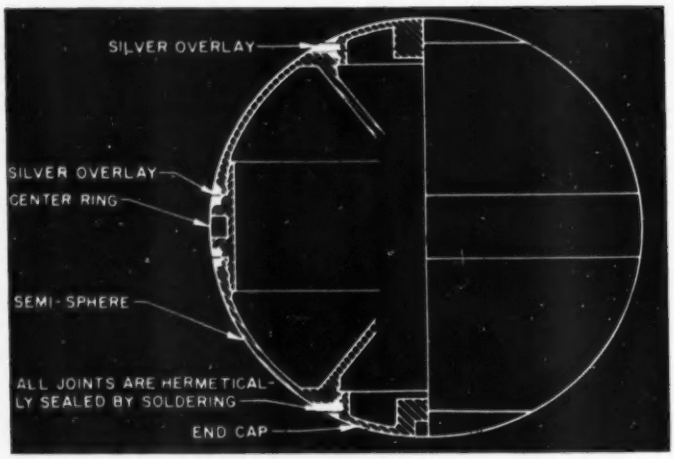


Fig. 1—Sketch of the titanium sphere assembly.

THE problem of finding a method for sealing the internal mechanisms of a titanium sphere against atmospheric conditions and leakage or chemical attack by floating and lubricating fluids stimulated a research program setup by the Aerophysics Materials Research Group of North American Aviation, Inc., in Downey, Calif. The most desirable method was considered to be soldering with soft solders. However, at that time there was no known combination of methods or metallic alloy (low melting) and compatible flux which would allow adherence, bonding or alloying with titanium effectively enough to guarantee a good sound joint.

The sphere, Fig. 1, consists of two end caps, two

Fig. 2—Induction brazing platform for brazing without flux.

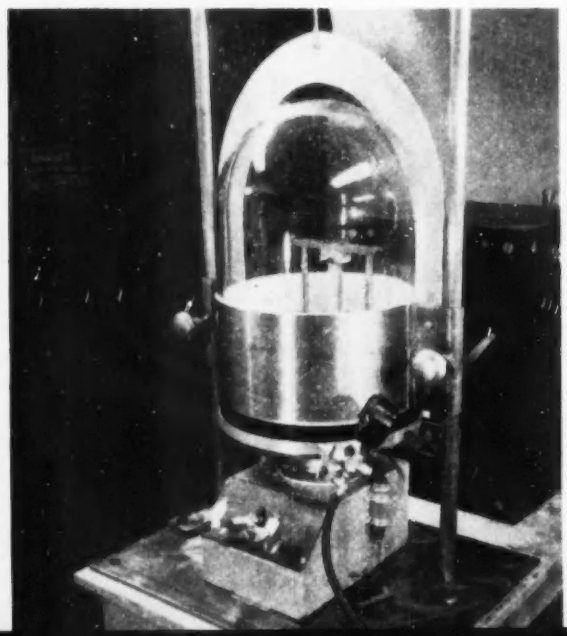
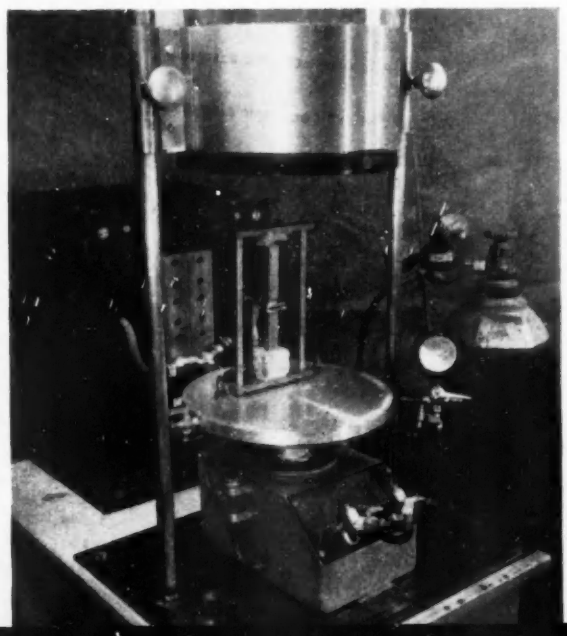


Fig. 3—Induction brazing platform with cover raised.



semispheres and one center ring. Engineering specifications required the four joints to withstand a helium leak rate equal to or less than 2.5 x 10^{-8} cc/sec and the method used to seal the sphere assembly was to allow disassembling and reassembling at any time without injury to its contents.

Brazing and Soldering Processes

Three procedures have been adopted to produce a hermetic seal by soldering. First, braze a solderable material within the sealing area or second, provide a silver overlay within the sealing area. These two procedures allow soft soldering, at the sealing area, by conventional techniques. Or, thirdly, solder directly.

The first process used for silver brazing dissimilar metals to titanium was an inert gas shielded induction heating process. The silver overlay process is accomplished with a "Heliarc" torch using a high frequency alternating current welding transformer. Soldering directly to titanium is also done by the "Heliarc" process.

Induction Brazing

Preliminary brazing tests revealed that titanium is a very brazable material, but the ability of the metal to absorb oxygen, nitrogen and hydrogen is detrimental at brazing temperatures. Because titanium is such a reactive metal and its thermal conductivity is so low, a suitable brazing process is considered to have the following properties: quick, local, uniform heating; inert gas protection; moderate cooling.

Figure 2 shows an inert gas induction brazing platform that was developed for brazing without flux. The platform is shown in the brazing position. The small black box behind the platform is an Ajax focus inductor. To the left is a partial view of the focus inductor's power source, a 20 kw Ajax induction spark gap converter.

The induction brazing platform was designed to enable the utilization of the three titanium brazing requirements mentioned before. Quick, local, uniform heating is afforded by the focus inductor work coil shown surrounding the titanium shear specimen within the insulated jig fixture (Fig. 3). Inert gas protection is produced when the bell jar assembly is lowered and forms a seal on the platform base plate. When the brazing chamber is thus affected, a vacuum is taken on the chamber and then an inert gas is allowed to purge the brazing chamber by passing into the gauge side, circulated in

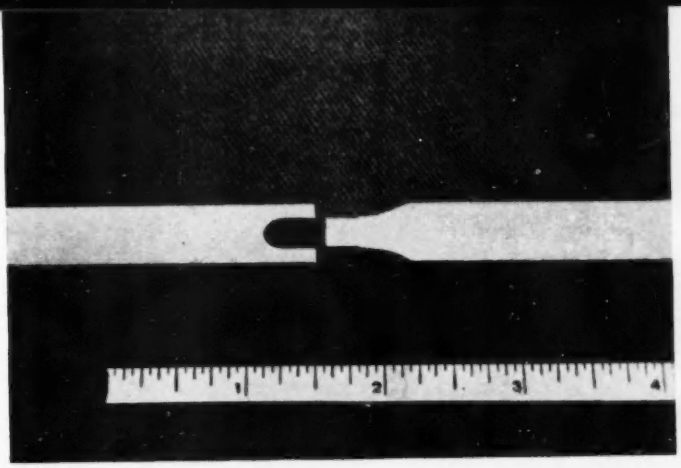


Fig. 4—Shear test specimen typical of all used.

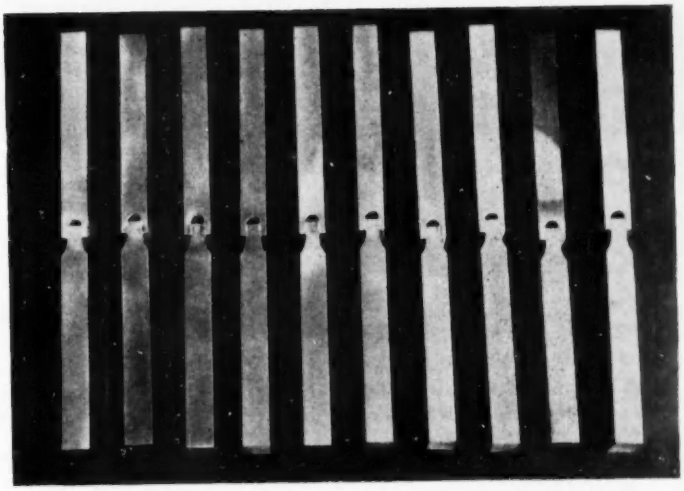


Fig. 5—Commercially pure titanium shear specimens as brazed (side view).

TABLE 1

MECHANICAL PROPERTIES OF JOINTS BRAZED WITH PURE SILVER, THE SILVER-COPPER EUTECTIC, AND EASY-FLO NO. 45

(Ultimate Shear Strength)

Specimen No.	Bonding Agent	Time at Temp. (min)	Total Elong. (in.)	Failing Load (lb)	FSU (psi)
1	Ag	4	0.0088	8,175	21,800
3	Ag	3	0.0084	8,300	22,133
4	Ag	1.75	0.0076	8,500	22,666
10	Ag	1.50	0.0064	9,040	24,106
5	Ag-Cu	1.33	0.0084	7,605	20,266
6	Ag-Cu	1.0	0.0052	9,275	24,733
7	Ag-Cu	1.0	0.0042	7,050	18,800
8	Ag-Cu	0.853	0.0040	7,300	19,466
9	EF No. 45	1.0	0.0034	6,250	16,666
11	EF No. 45	0.7	0.0040	7,675	20,466

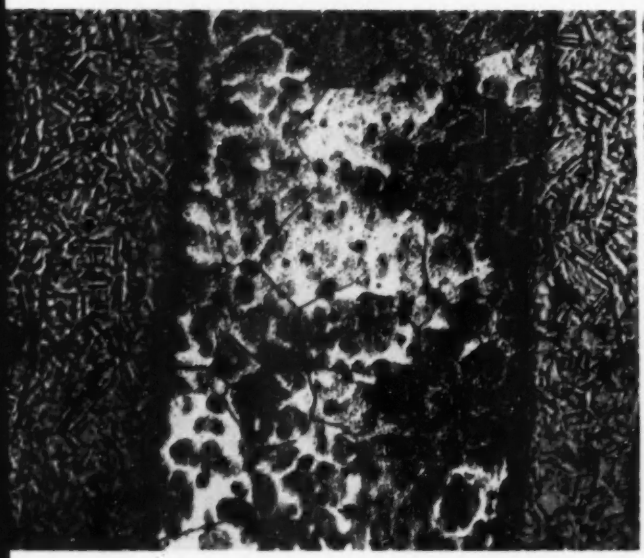


Fig. 6—Metallography study of titanium-silver brazed joint

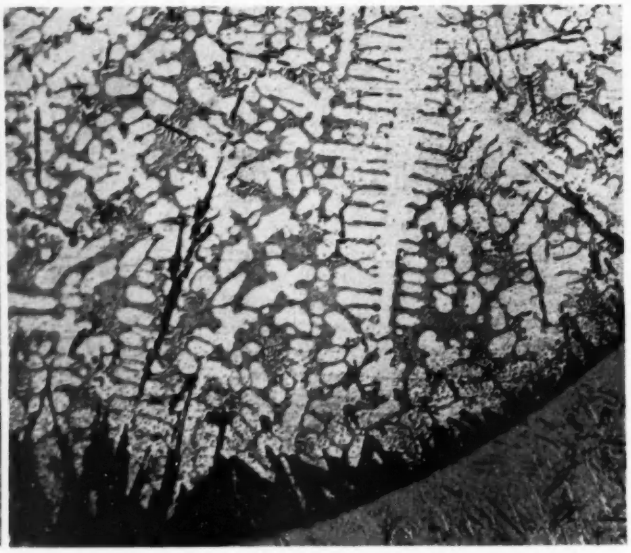


Fig. 7—Metallography study of titanium-silver-copper induction brazed joint

the chamber and allowed to escape through an orifice.

Filler Metal Alloying Characteristics

During the preliminary inert induction brazing tests a terrific amount of intermetallic alloying was found to exist within the silver alloy brazed joints at the interfaces of the titanium-silver alloy zones. The resulting joints were very strong but they were also very difficult to machine, displaying varying degrees of hardness throughout the brazed joint.

In order to comprehensively determine the significance of joint strength in relation to the type of filler metal used for brazing, a shear strength program was established. The specimen shown in Fig. 4 is typical of all that were used. They were made from MST Grade III hot forged bar stock.

A portion of the shear specimens induction brazed with pure silver, a silver-copper eutectic and Easy Flo No. 45 silver brazing alloys are shown in Fig. 5.

Figure 6 illustrates the typical microstructure of an inert gas induction silver brazed joint. The filler metal used was 0.003 in. commercially pure silver shim stock preplaced prior to brazing. The MST Grade III titanium has been heated to 1900 F for approximately three min, cooled in an argon atmosphere to 600 F and then quenched in water to room temperature. The bonded zones at the interfaces are very narrow indicating excellent wetting characteristics and negligible alloying. The structure of the intermetallic compound, if any, is not identified. Magnification: 250 diams.

As a comparison, Fig. 7 shows the type of microstructure obtained from silver brazing alloys containing copper are used. This particular micrograph was made of an induction cast and bonded joint, during experiments involving the development of silver over-

Fig. 8—Inert-arc silver brazed center ring

Fig. 9—Inert-arc silver brazed center ring—overlay machined

laying titanium. The silver brazing alloy used is a silver-copper eutectic alloy, containing 72 per cent silver and 28 per cent copper. The titanium (bottom) is Ti-75A. The structure of the intermetallic compound appearing at the bottom, along the titanium interface, has not been identified.

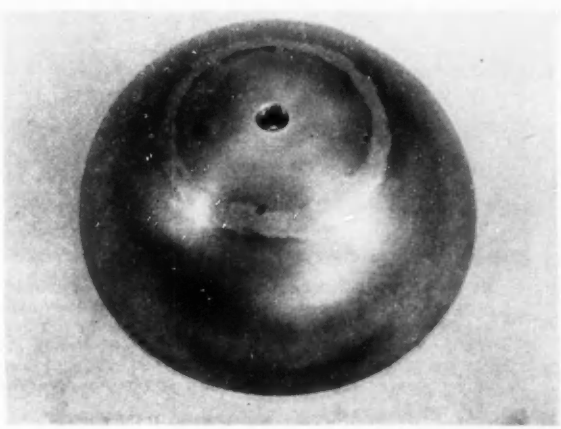
Induction Brazing Conclusions

The extent of our investigation covering the shear strength of silver and silver alloy brazing of commercially pure titanium is not too great, but we have come to the conclusion that pure silver is one of the better bonding agents. It has excellent wetting characteristics, the alloying effect is negligible which permits finish machining operations after brazing without undue tool wear and joint fracture and the joint strength is superior to the joint strength developed by other silver brazing alloys.

Table 1 depicts the results obtained with pure silver, the silver-copper eutectic, and Easy Flo No. 45. Note the significance between the time at temperature and the ultimate shear stress. The joint clearances were constant, the amount of filler metal preplaced within the joint interstices was constant, the inert gas used for purging was consistent and the cooling procedures were the same. The only significant difference in making these specimens was the time at temperature and the type of filler metal.

The table shows that as the time at temperature decreases the strength increases, for those specimens brazed with pure silver. The specimens brazed with the silver-copper eutectic alloy follow a very erratic pattern. The specimens brazed with the Easy Flo No. 45 alloy tend to follow a definite pattern like the pure silver specimens, but there weren't enough specimens tested to really be specific.

Fig. 11—Titanium hemisphere inert-arc soft soldered



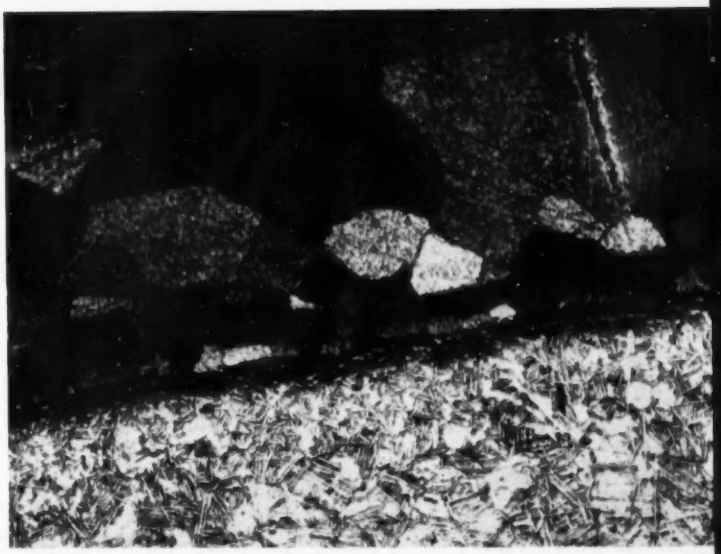


Fig. 10—Metallography study of titanium—silver inert-arc brazed joint

Heliarc Brazing

The inert gas induction brazing process is suitable for effecting a brazed joint by utilizing capillary flow and where maximum strength is required, but like every other joining process it has its limitations. A faster method with which a silver overlay could be produced other than by induction brazing was required.

A preliminary investigation, made last year, revealed that fine silver could be brazed to pure titanium with an alternating current high frequency welding transformer, using the Heliarc torch with a non-consumable thoriated tungsten electrode and argon gas.

Mock-up tests were made in order to evaluate the adaptability of this method of providing a hermetic seal for the titanium sphere joints. Fig. 8 shows the center ring silver overlayed by the inert-arc process. The same center ring is shown in Fig. 9 with the silver overlay machined to finished dimensions.

As a comparison the microstructure (Fig. 10) of a pure silver argon-arc overlay (top-large grains) on commercially pure titanium (bottom acicular structure) is similar to the inert induction silver brazed microstructure. Note the very narrow bonding zone (black line).

Heliarc Brazing Conclusions

The use of this type of brazing is very limited. Tensile strength tests obtained from inert-arc silver brazed butt joints ranged between 42,000 psi for flushed joints to 52,000 psi for as brazed butt joints. To date we are using this method of joining for sealing and low loading purposes only.

As mentioned in the beginning of this report, soldering was considered the ideal method of sealing the four circumferential joints of the titanium sphere. (*Turn to page* 152, *please*)

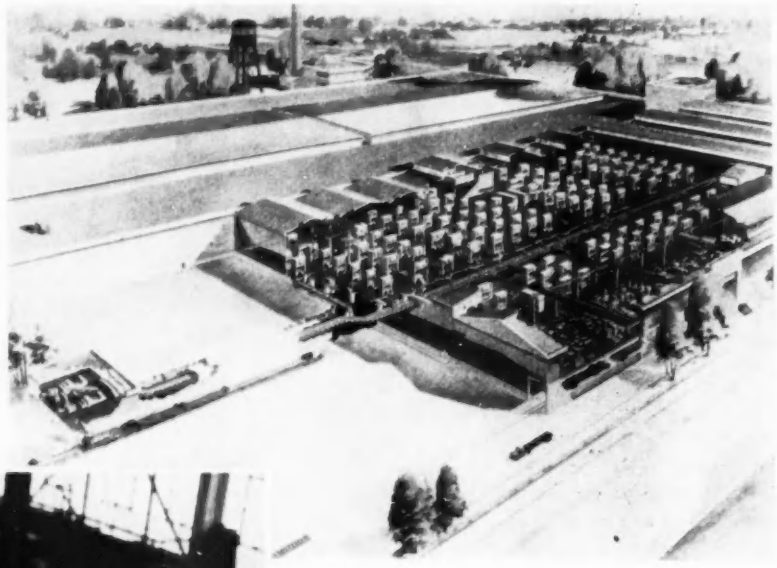


Fig. 1

Schematic drawing of Fisher Body plant layout, showing course of main scrap conveyor in the center, reaching out to the bale house at the extreme left. This view also shows a few of the collector or feeder conveyors connecting remotely located presses with the main scrap conveyor.

Scrap Disposal

Fig. 2

Key to the operation of the system is the baler control operator. He is seen above at the console watching the flow of scrap and controlling the movement of the tipple to one baler or the other.

By Joseph Geschelin

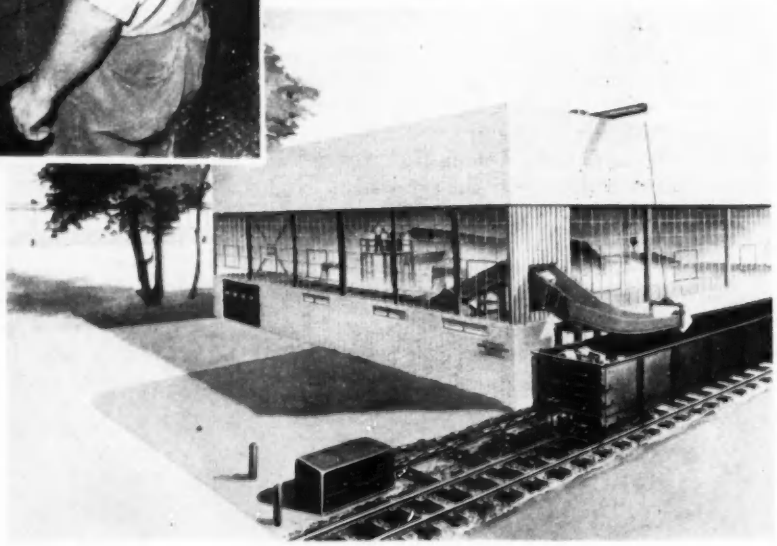


Fig. 3

Detail of the baler house, showing method of loading gondola cars. The bales are carried upward above the grade level of the cars to facilitate gravity loading. The operator handles even distribution of bales in the car by controlling the level of the end chute as well as by moving the car by means of the conveyor at the left.

by Automation

CERTAINLY one of the most advanced sheet metal operations in the industry, the Fisher Body Plant (Plant 1) in Grand Rapids features automation on all press lines and has in full swing a fully automatic scrap disposal system, said to be the largest unit of its kind in General Motors. Aptly called an industrial subway, scrap disposal is handled by means of an underground scrap conveyor line designed by Fisher Body Central Works Engineering Section. It is designed to transport up to 550,000 lb of metal daily.

Briefly, it may be said that the scrap conveyor carries steel scrap directly from the trim presses to a baler house in the rear of the property where it is pressed into bales and loaded onto gondola cars for shipment to the steel mills. Besides being a major safety feature, since workers no longer have to handle scrap by hand, the system speeds up press operation by preventing scrap from piling up on the press bed and thus eliminating the need for shutting down momentarily from time to time. As will be noted later, it has still another important advantage. By suitable die design coupled with a system of chutes and deflectors, scrap is segregated for most economical disposal.

Moreover, the linking of all presses to the scrap conveyor has eliminated practically all of the usual handling of scrap in tote boxes and has reduced the amount of materials handling by industrial trucks.

Figure 1 is an artist's drawing of the plant layout, showing schematically the layout of presses, the central location of the main scrap conveyor, and some of the underground feeder conveyors connecting remotely located press lines with the main conveyor. At the extreme left is the baler house, located remotely to permit further plant expansion in the future.

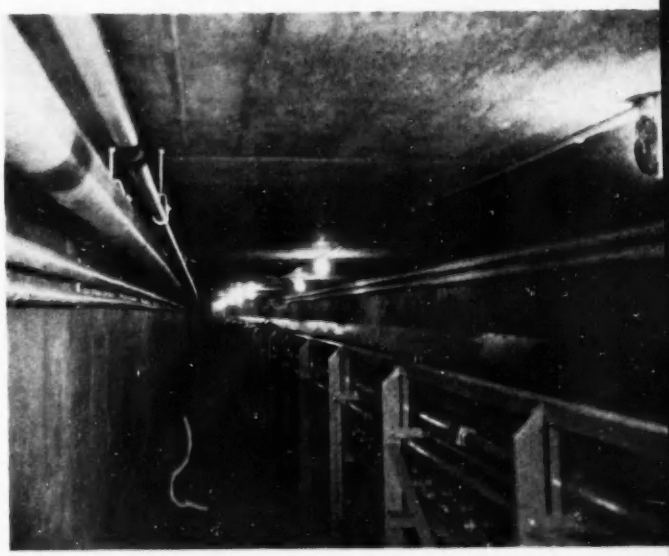
The main scrap conveyor, located directly beneath the main trim line, has sprocket centers at 1145 ft and operates at a controllable speed with a maximum of 50 fpm. Weight of scrap averages 20 to 30 lb per lineal ft and conveyor speed usually is around 20 fpm. Power for this line is supplied by two, 10-hp drives.

Remotely located presses on lines at right angle to the main press line are connected to the scrap conveyor by means of some 20 individual collector scrap conveyors, each one being individually driven.

Visual examination of this setup shows clearly that the project required considerable time and a large expenditure of money for its integration, as it required detail study of each press and each die for every individual part made in the plant.

Consider that from the standpoint of cost economy all scrap has been divided into three categories:

1. Scrap suitable only for baling, directed to the scrap conveyor for transport to the baler house.
2. Offal—larger flat pieces of irregular shape suitable for use as blanks for small stampings made in the plant.
3. "Bushlings"—small flat pieces, generally small disks resulting from piercing operations. These are collected separately and shipped loosely in freight cars to the mill.



View of a section of the main scrap conveyor line, shown here as it traverses underground between the press shop and the baler house.

Each die, depending upon the nature of the job, has been designed to handle one or more of these three categories. Dies are fitted with a series of scrap cutters to reduce trim to proper size for handling, with deflectors and chutes leading to the main scrap conveyor or to a feeder conveyor as the case may be. In some cases the press bed is fitted with a small conveyor to carry out scrap from otherwise inaccessible points.

In cases where offal is produced by piercing or punching there is a suitable hole in the die to permit the pieces to fall through a separate chute leading to a container under the floor. In some cases, where offal can be used in small presses in the immediate vicinity, it is discharged directly onto a conveyor feeding a tote box near the press.

"Bushlings," where they are produced, are di-

Cutaway drawing at one of the presses to show how the main scrap conveyor receives scrap from the press line.

rected through holes in the die, falling down a chute leading under the floor to still another container. Later these containers are transported by industrial trucks to the baler house for loading directly into gondola cars without baling.

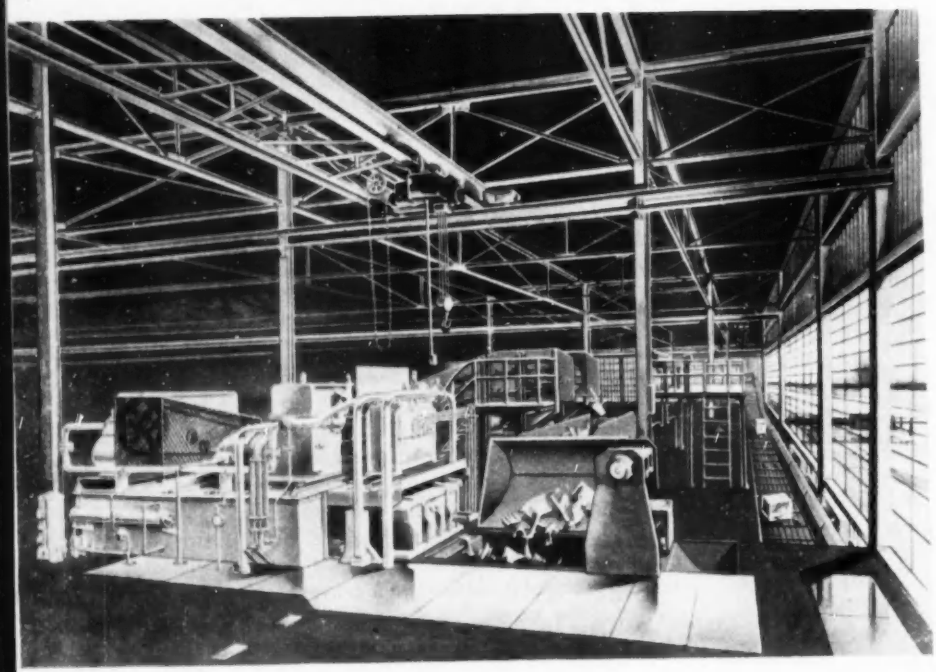
The baler house is two stories high to permit installation of the two Logemann balers high off the foundation, leaving ample headroom for accessories and permitting maintenance with considerable ease. It is of interest that the balers are provided with duplicate drives as well as an additional source of stand-by power to prevent shutdown.

The baler operator is the key to the proper functioning of the entire system. Standing at his controls, Fig. 2, he watches the flow of scrap on the conveyor by means of a large mirror mounted in the rear. His main job is to fill the tipple directly in front of his station, alternating dumping into one baler or the other. While the tipple is being filled one of the balers is going through its cycle of preparing the bale. As a bale is finished, it is automatically ejected onto the heavy-duty conveyor running at right angles to balers and unloading eventually into a gondola car. Maximum weight of baled scrap is held to about 700 lb for every six ft of conveyor length.

It is of interest that the balers operate on an entirely automatic cycle from start to finish. However, in the interest of safety, manual controls are provided for each phase of operation wherever special attention may be required.

Figure 3 is a drawing showing the method of loading bales into freight cars. Within the baler house, in the center, may be seen the baler conveyor arching upward above the railroad car grade to permit gravity discharge into the gondola car. The operator has full control of the loading operation by means of the hinged end chute which is operated by a hoist on the baler house roof designed to facilitate proper loading of the car. Another noteworthy feature is the reversible car puller and conveyor also controlled by the baler operator. The conveyor, as shown in the foreground at the left, is on 309 ft, 9-in. sprocket center and has a drive unit capable of handling four loaded gondola cars. By operating this conveyor the baler operator can move a car progressively to distribute the load evenly and can move the loaded car out of the way to make space for another.

View in baler house showing method of loading scrap into one of the balers. The completed bale is pushed out of the machine to the right and onto the bale conveyor leading to the rear at the extreme right.



Novel Diesel Burns Wide Range of Fuels

RECENTLY the firm of Barnes & Reinecke developed an almost completely new type lightweight Diesel engine for the Air Force. It is aircooled and able to burn fuels of varying cetane numbers, from ordinary Diesel fuel through jet fuel, and ordinary gasoline up to 100-octane aviation gasoline.

The Air Force had restricted the possible approaches to this problem to port-controlled two-stroke engines. They had, furthermore, specified that the scavenging system employed should achieve a symmetrical distribution of the inlet and outlet ports. They had also decided that a supercharged version should be developed.

Basic steps were taken to develop:

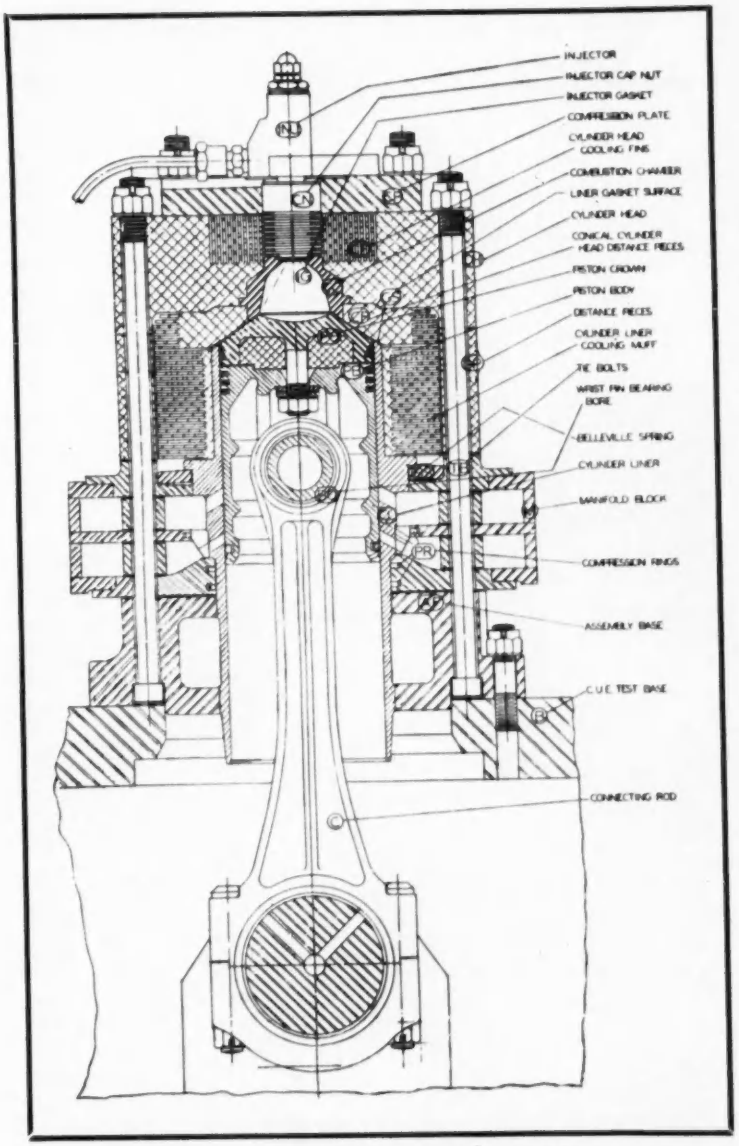
(1) A centrally symmetrical port controlled scavenging principle.
(2) A suitable combustion chamber to accommodate the residual flows resulting from this scavenging system.
(3) An injection pattern which would suit this combustion chamber and make possible the highest mean effective pressures compatible with the trapped air charge inside the cylinder.
(4) An air cooling system.
(5) A fuel injection system capable of injecting gasoline.

Main engine data were fixed in agreement with the Air Force at: design speed, 1500 rpm; bore and stroke, 3⅝ in. by 4¾ in.; supercharging pressure, 10 psi gage.

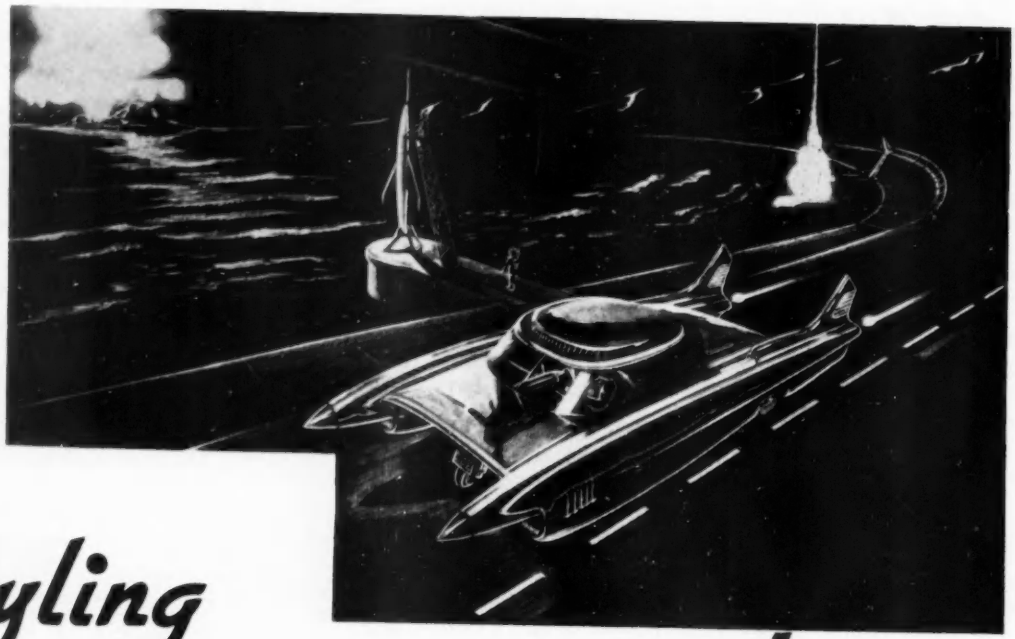
A flexible test engine was achieved by a stack-up principle, in which all parts of the engine were assembled in a building block arrangement, and compressed on the assembly base by means of long tie bolts. The cylinder liner with its shrunk-on air cooling muff was supported on the block by a Belleville spring. A compression plate pressed all the parts tightly together by means of tie bolts fastened to the assembly base, and carried suitable means for mounting the injection nozzle. When compressed, the assembly could resist combustion pressures which sometimes went up to 1800 psi. The combustion chamber proper was pressed into the cylinder head and held between the cylinder head proper and the cylinder head distance piece by the pressure of the tie bolts.

The most difficult development turned out to be a centrally symmetrical mushroom type flow. After approximately 270 different configurations were investigated on the water analogue test

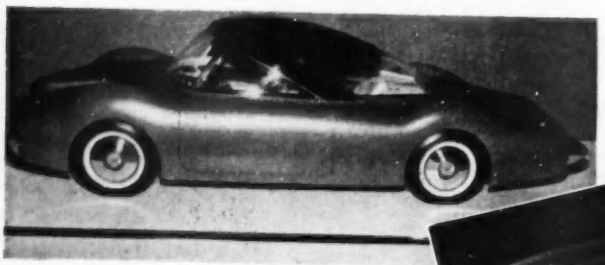
(*Turn to page* 144, *please*)



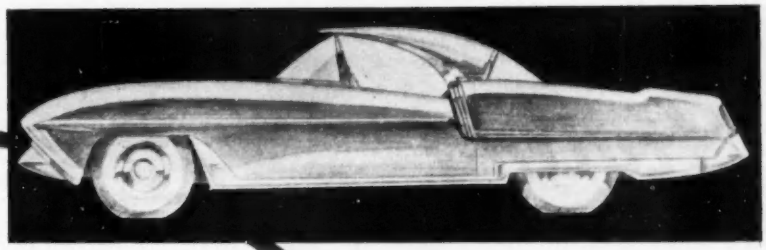
Transverse sectional view of the test engine.

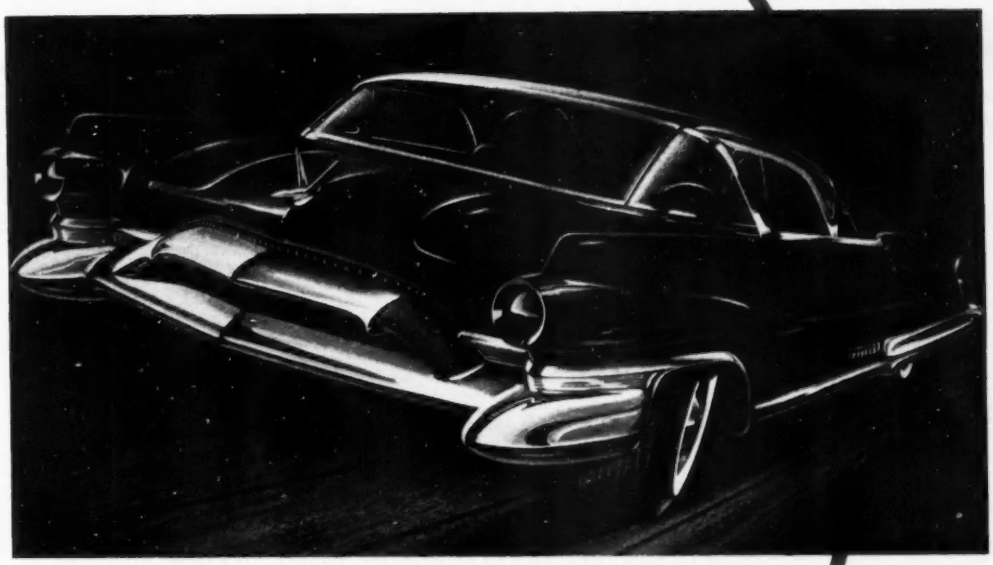


Styling *in the* CRYSTAL BALL

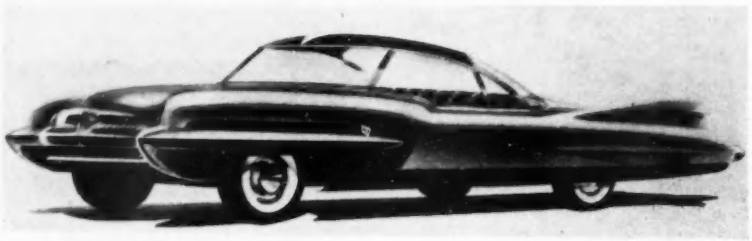


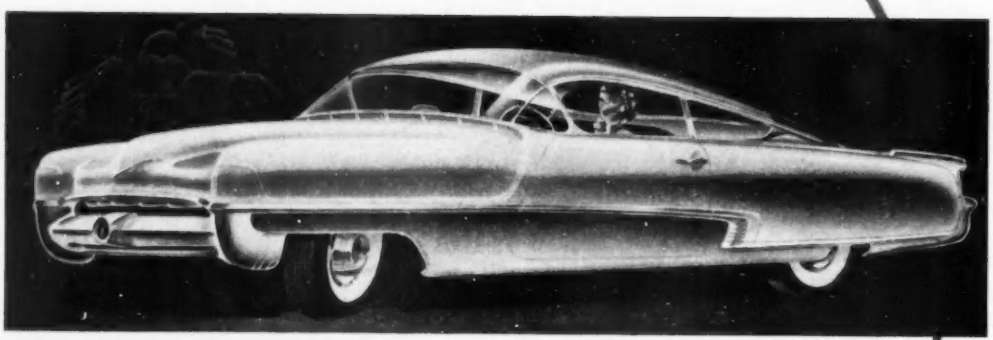
HERE are some futuristic impressions from the drawing boa[illegible] shown by General Motors, Chrysler, Ford, and Packard styling sections. Obviously, the designs shown here are in the crystal ball stage and do not necessarily represent any specific styling for production.

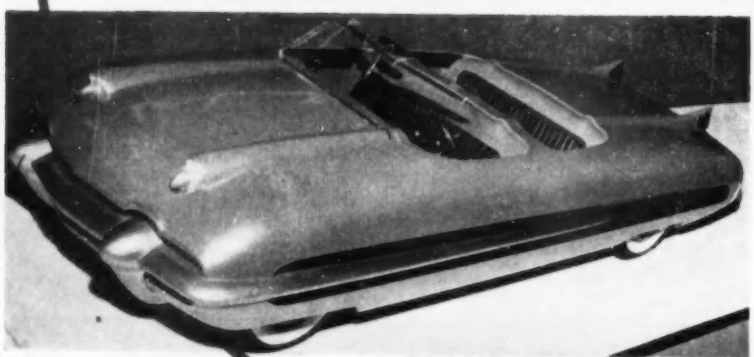


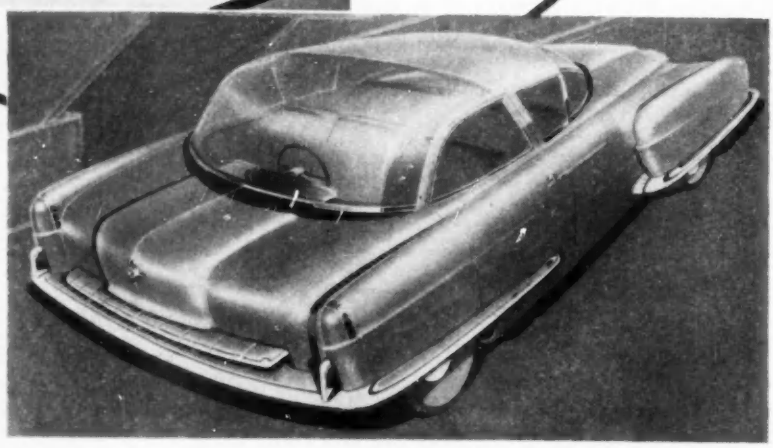


Styling in the CRYSTAL BALL









. . . . Continued . . . .

$35 Billions More Available for Defense

By Karl Rannells
Washington Bureau
AUTOMOTIVE INDUSTRIES

BEST overall answer to industry's current Government-order questions is that the Korean truce signed in late July will have no marked effect on the Defense Department's procurement for considerable time to come, except to assure a leveling-off of the current rate.

A major reason is that peace is actually months in the future, and will follow the truce only after long negotiations. Mobilization for defense will not slow down materially in the interim.

Pentagon experts figure that spending could drop by as much as $1 billion. This would be spread largely over specific fields such as combat vehicles and ammunition, since the replacement rates would be much less as a result of the truce.

As finally legislated, the Defense Department is to get nearly $35 billion in new money to work with during the fiscal year that's just begun. Of this total, more than $9 billion has been earmarked for major procurement purposes such as planes and ships, tanks and other mobile equipment, guns, ammunition, etc.

In dividing up the 1954 budget pie for the military services, Congress dropped the Air Force back into second place with $11.2 billion and gave Army the biggest slice, amounting to $13 billion. This gave the Air Force roughly $4 billion less than it believed the absolute minimum needed. Navy got $9.5 billion.

Biggest appropriation hassle has been over aircraft procurement. Here only the Air Force and Navy (including the Marine Corps) was materially affected due to the fact Army aircraft procurement is largely limited to planes of the liaison type and helicopters. Air Force procurement officials based their protests against the budget slash on the argument that about $6.7 billion in new money would be needed for procurement of planes and related items.

But Congress decided that $3.5 billion in new money for aircraft and related items would be sufficient for the current fiscal year. It's thinking ran like this:

From the beginning of the Korean shooting through June 30 roughly $29.6 billion had been appropriated and made available for this type of procurement. As of July 1, only about $9.9 billion had actually been paid out.

As far as Congress was concerned, this meant that industry still had nearly $20 billion in undelivered Government orders on its books. The appropriations committees found that there was also an unobligated carry-over of $2.5 billion—including an Air Force under-estimate of $700 million.

This, added to the $3.5 billion being appropriated in new money, made the total available for new obligation rise to more than $6 billion.

Thus, concluded the committees (and agreed to by both houses), the total actually available for expenditure is adequate "to carry the Air Force for more than three years at the present rate."

This position is taken on the basis that since June 1950, approximately 21,000 planes have been placed on order. Delivery rate for the Air Force has climbed upward to where it is now about 650 a month and is scheduled to keep rising until next March when it is to level off at about 730 planes a month under the stretchout program.

Under the January budget, the Air Force would have been authorized to go ahead and place orders for about 3650 new planes. The new figure, as provided for in the appropriation, is reduced to around 1400 craft. Included in the reduction are nearly 300 craft which the Air Force had already decided to eliminate.

In view of the $20 billion unexpended balance, the appropriations committee said bluntly it was "doubtful" of the necessity of such long lead time in view of changing conditions and new developments in the field of aeronautics.

In addition, Congress voted $600 million in new money for procurement of major items other than aircraft and spare parts. This includes ground powered and marine equipment, training equipment, and electronics and communications equipment other than that for installation on aircraft itself.

Added to this is a carry-over of $2.9 billion which would bring the total to $3.5 billion, of which $1 billion would be available for new contracts.

Only a minor amount—more specifically, about $21 million—was cut out of Navy's request for aircraft procurement funds for itself and the Marine Corps. This leaves Navy with approximately $1.4 billion in new money for purchase of planes and parts.

Added to the $7.4 billion carry-over which had previously been appropriated to pay for deliveries of aircraft now on order, the resulting total is figured at enabling Navy to maintain its present operating strength of approximately 10,000 planes.

No reduction is planned in either the number of Navy carrier groups or the Marine Corps strength of

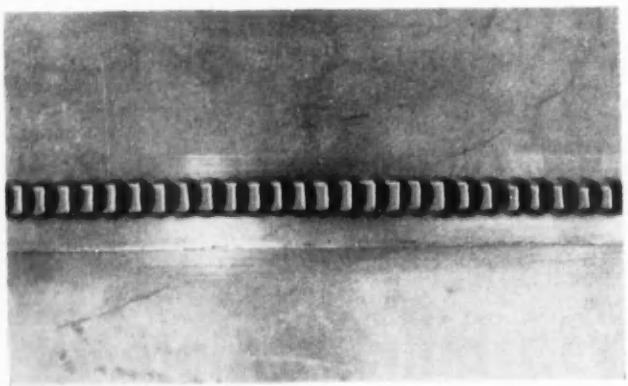
(*Turn to page* 150, *please*)

Fast Roll-Spot Technique Doubles Welding Speeds

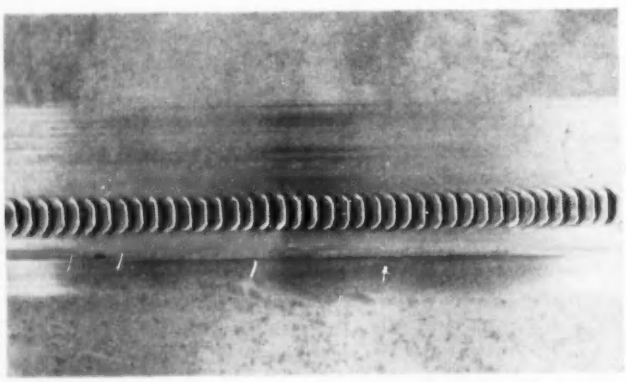
By J. R. Fullerton, Welding Supervisor
Engineering Development Laboratories, Ryan Aeronautical Co.

WITH a new technique and modified facilities, spot welding engineers at Ryan Aeronautical Co. have stepped up welding speeds more than 100 per cent and, at the same time, improved weld quality. Using specially equipped Taylor-Winfield machines, Ryan production is accomplishing gas-tight seam welds at 26 ipm compared with speeds of between six and 12 ipm formerly achieved. Spot welds on one-in. spacings can be installed at 68 ipm in contrast to the former rate of only 21 ipm.

This accelerated performance is attained in the welding of tough stainless steels, Inconel X and W, Haynes Stellite No. 25 and other crack-sensitive alloys used in the fabrication of built afterburners, variable nozzles, exhaust cones, tail-pipes and high temperature jet engine components.



The gas-tight seam shown here was made in Inconel W by the fast roll-spot technique with intermittent action on the wheel electrodes.



Gas-tight seam in Inconel W which was made by means of continuous action wheel electrodes. This method requires almost twice as many overlapping spot welds per running inch as the fast roll spot technique.

For this work Ryan is using new Taylor-Winfield machines which have been equipped with fast-indexing mechanisms for roll-spot welding. These devices are air-operated, electronically-controlled units consisting of two horizontally-opposed bellows which actuate an overriding clutch. Powered by standard air line pressure of 80 psi, the clutch rotates the upper wheel electrode of the machine. By pressing a switch the continuous electric seam welding drive mechanism of the Taylor-Winfield is detached and the roll-spot drive takes over. It can be set by indicator to index in single or multiple movement and spot weld at spacings from zero to five in.

The new controls are a distinct advantage over the Geneva-type drives used heretofore. With the Geneva drive, limited flexibility is available because the proportion between the dwell time and indexing time is a fixed ratio depending upon the gearing and drive mechanism. It can be varied in fixed increments only. The Taylor-Winfield air-operated drive provides infinite flexibility in varying dwell and indexing time ratios.

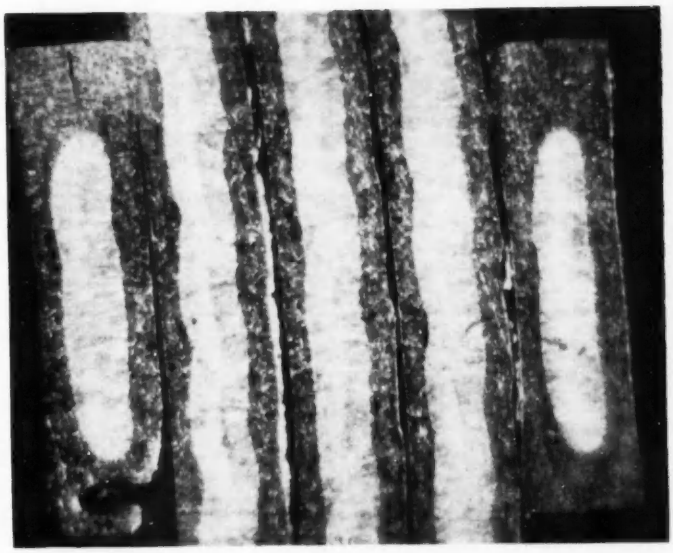
Although the new mechanism was developed to accomplish spaced-out spot welds at increased speeds, Ryan spot weld engineers

have conceived another application for it—faster seam welding. With continuous drive machines, certified, gas-tight team welds could not be formed at speeds exceeding six to 12 ipm in the crack-sensitive alloys. When these rates were exceeded, the metal temperature rose to the point where undue shrinkage and distortion occurred and cracks developed.

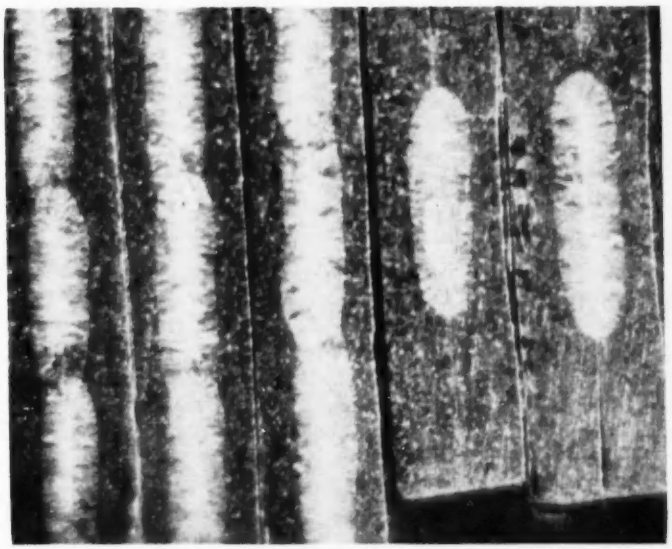
Careful analysis of this phenomenon disclosed that it required a large number of overlapping spot welds to produce gas-tight seams with continuously rotating electrodes because each spot weld was inferior to that produced under static conditions. Consequently, Ryan technicians directed their efforts toward attainment of the speediest intermittent operation commensurate with high quality.

The Taylor-Winfield drive was speeded up even beyond its already rapid action. Exhaust mufflers were changed and a design which exhibited less back pressure was installed. A Ryan-improved air intake valve, with snappier action, was incorporated. A new type of faster-meshing gearing is being developed to provide more speed.

With these facilities, Ryan engineers worked out new performance ratios in which time was compressed to the minimum. Dwell time, during which the electrodes are motionless, was reduced to the shortest possible interval but kept long enough to produce sound spot weld structure. Indexing time, which is time lost in making the switch to the next spot weld location, was also cut to the bare minimum. Because of the flexibility of the equipment, these time ratios could be coordinated for different materials and thicknesses with complete freedom.



Photomicrograph of single and seam welds made by fast roll-spot methods. Note that the spot welds are substantially larger than those made by conventional continuous action.



Photomicrograph of single weld and seam welds made by conventional continuous action.

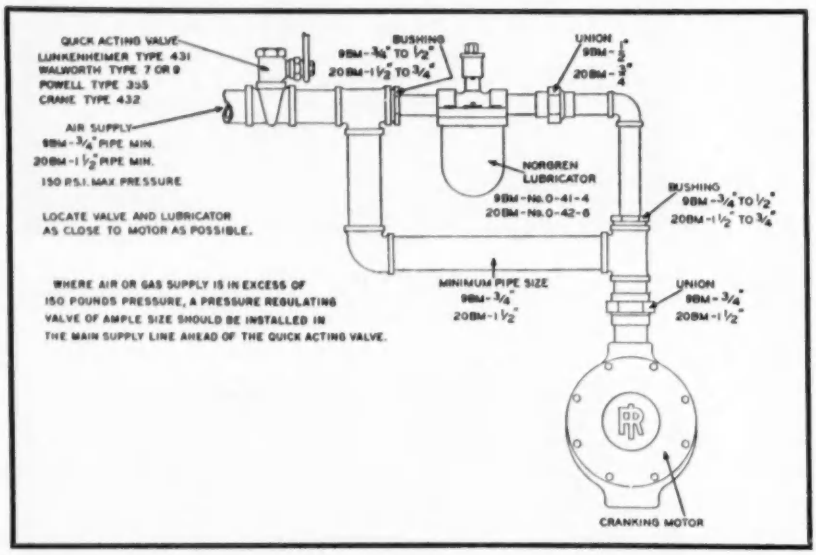
Once precision control of intermittent operation was attained it was found that better spot welds could be accomplished than under continuous operation. The spot weld nuggets were sounder because the metal was held under forge pressure during the cooling cycle and a larger, stronger nugget was made. Also, by holding the sheets during cooling, shrinkage and distortion from heat were greatly reduced.

With sounder spot welds available, it became evident that gas-tight seam welds could be formed with fewer spot welds and at greater speeds. This has proved to be the case. For instance, on a typical Ryan afterburner assembly formed from two sheets of 0.045-in. Inconel W, Ryan previously had to install 11 overlapping spot welds per running in. to form certified seams under continuous drive. Because of the proximity of the spot welds, this work could not be done at speeds exceeding 12 ipm due to the heat accumulated. With the new roll-spot technique, Ryan is performing certified seams with only five-and-a-half spot welds per in. and can make 26 in. of seam per minute.

(*Turn to page* 98, *please*)

AIR STARTERS

for Commercial Vehicles


QUICK ACTING VALVE
LUNKENHEIMER TYPE 431
WALWORTH TYPE 7 OR 9
POWELL TYPE 335
CRANE TYPE 432
AIR SUPPLY
9BM - 3/4" PIPE MIN.
20BM - 1 1/2" PIPE MIN.
150 P.S.I. MAX PRESSURE
LOCATE VALVE AND LUBRICATOR AS CLOSE TO MOTOR AS POSSIBLE.
WHERE AIR OR GAS SUPPLY IS IN EXCESS OF 150 POUNDS PRESSURE, A PRESSURE REGULATING VALVE OF AMPLE SIZE SHOULD BE INSTALLED IN THE MAIN SUPPLY LINE AHEAD OF THE QUICK ACTING VALVE.
BUSHING
9BM - 3/4" TO 1/2"
20BM - 1 1/2" TO 3/4"
UNION
9BM - 1/2"
20BM - 3/4"
NORGREN LUBRICATOR
9BM - No. 0-41-4
20BM - No. 0-42-6
BUSHING
9BM - 3/4" TO 1/2"
20BM - 1 1/2" TO 3/4"
MINIMUM PIPE SIZE
9BM - 3/4"
20BM - 1 1/2"
UNION
9BM - 3/4"
20BM - 1 1/2"
CRANKING MOTOR

Recommended throttle and lubricator arrangement in a typical air starter installation.

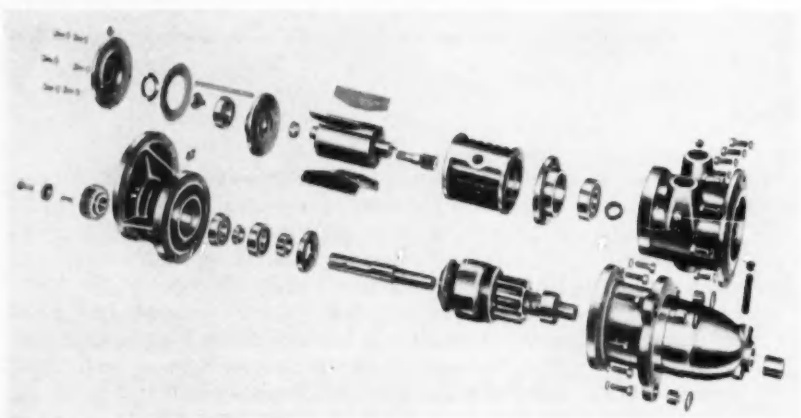
By Thomas Mac New

QUITE recently the air starting system for mobile equipment has been installed by several truck and bus fleet operators on air-compressor equipped vehicles formerly started by electrical means. The operators found that this starting method saved up to 300 lb in vehicle weight and permitted them to use a six volt electrical system instead of a 12 or 24 volt system on vehicles powered by Diesel engines.

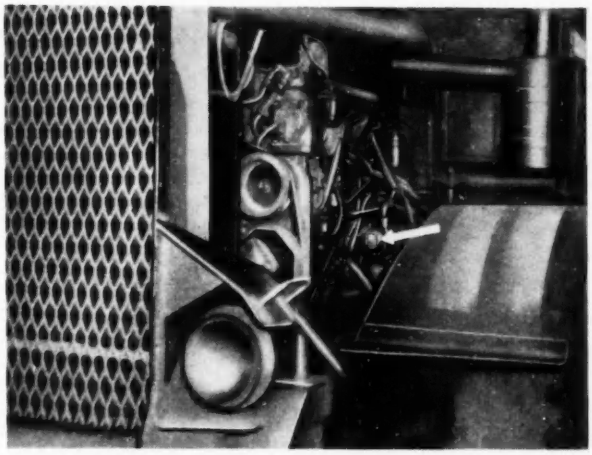
Now, after much research, at least one truck manufacturer is using the air starter on production vehicles and others are offering it as optional equipment, or are about to go into production of a line of trucks equipped with air starters. Many other truck and bus producers are still in the testing stages.

In addition to the truck and bus producers, and the operators of fleets who have been installing the air starting equipment on vehicles currently in operation, Army Ordnance appears to be interested in the method for use on military conveyances, according to reports.

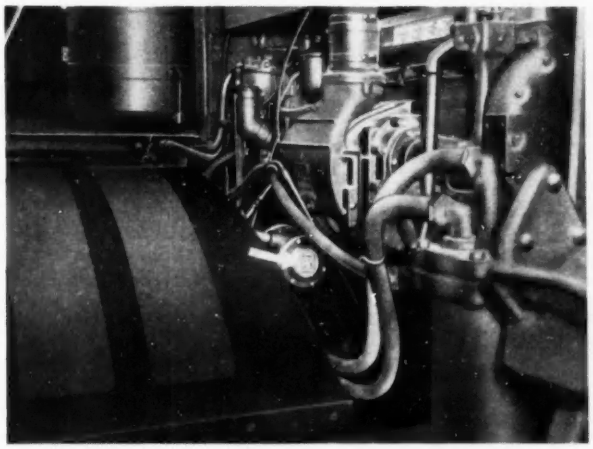
Probably one of the first manufacturers to become interested was the Euclid Road Machinery Co., which in cooperation with a fleet operator installed an air starting system on a 300 hp Cummins Diesel that powered a 22-ton Euclid truck used on the Mesabi Range.



Exploded view of the Ingersoll-Rand air starter, gear train, and the Bendix drive.



This air starter installation was made on a 200 hp Cummins Diesel that operates on the Mesabi iron range.



Air starter installation on a General Motors 6-71 Diesel of 200 hp. Several of these engines have been equipped with the 9BM starter for service on the Mesabi iron range.

air starter as an option on their off-the-highway vehicles where it is said to have been very widely accepted. At least one truck allegedly has been built by International highway type, with an air starting system.

The Ingersoll-Rand air starting system which is being utilized for these installations consists of an air motor, a conventional Bendix drive, an air receiver or tank, and the necessary plumbing and valves. The air compressor used for the vehicle's braking system is also utilized to supply air for the starter operation.

In respect to the air motor, it was designed for heavy-duty industrial use—24 hr per day service. Actually, an automotive starter, whatever the type, isn't operated more than five min per day except in some extreme circumstances. The motor is of the conventional vane type, with a ball bearing mounted rotor. Vanes are made of phenolic plastic; the cylinder material is a high grade cast iron, and the end plates, which form the air seal, are of bronze.

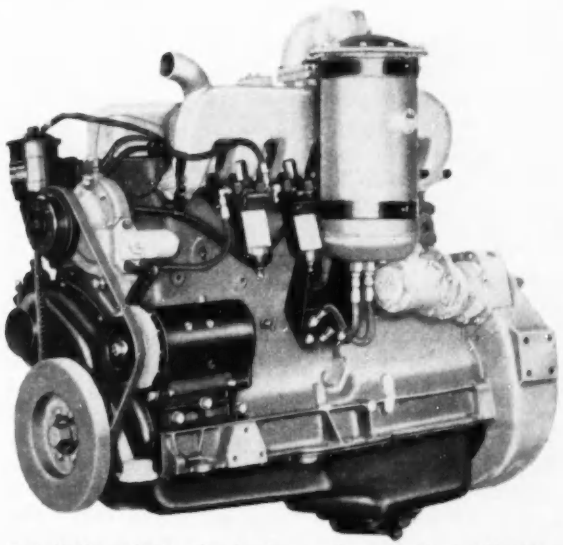
The five vanes used for the unit are of the floating type and air is used as a spring to force contact with the cylinder wall. Air enters under the vanes by means of drilled passages which receive the compressed air from slots cut in the end plates in a semi-circular fashion around the rotor bore. Intake and exhaust passages are cut in the cylinder walls. Exhaust air is ported through slots.

Reduction gearing also is incorporated with the motor. The pinion gear is splined to the rotor shaft, while the one reduction or drive gear is keyed to the output shaft which in turn drives the starter pinion in the Bendix starter drive. The output shaft runs on two anti-friction bearings which are located adjacent to the reduction gear. (*Turn to page* 112, *please*)

Since the original application was regarded as highly successful, numerous other vehicles operating on the vast iron range have been so equipped.

Two new series of Diesel powered COE highway trucks being produced by Mack Manufacturing Co. are coming off the line with the air starting system as standard equipment. These trucks include the four-wheeled H-61T and the six-wheeled H-61ST. This marks the first instance of production highway vehicles being so equipped. Mack is also offering the starter as an option on a recently introduced line of Diesel engines. (See AUTOMOTIVE INDUSTRIES, July 1.) Mack's current plans call for use of the air starters only on Diesel powered equipment. The company has found air starting particularly effective with Diesel engines since it spins the engine at considerably higher speed than the conventional electric starter, thereby providing quick and sure starts by reason of the higher temperatures thus produced in the combustion chambers.

Corbitt, Euclid, Mack, and others are offering the



Installation of the air starter on the new Mack END-673 Diesel.

The Importance of SAE Brake Fluids

By F. J. Markey, Product Engineer
Moraine Products Division, General Motors

PRIOR to World War II, there were no commercial or Government brake fluid specifications that specified the various tests and test result limits, based on actual brake service requirements. The U. S. Army Ordnance in 1942 called upon the War Engineering Board, the Coordinating Research Council, and S.A.E. engineers to help them compose a suitable specification for brake fluids to be used in Army vehicles. The result of the joint effort of Army and civilian engineers was the Ordnance Brake Fluid Specification 2-111. Fluids meeting the 2-111 specification were considered suitable for use in hydraulic brakes operated under the most severe conditions that might be encountered throughout the world; thus, only one brake fluid specification was written for the Army.

Following the war the automobile manufacturers and brake engineers became greatly concerned about the number of serious accidents due to brake failures. It was found that too many unsuitable fluids were being sold as brake fluids, and the recognized safety initially built into hydraulic brakes was being jeopardized by the use of such materials in service.

In order to try to prevent the use of unsafe fluids in hydraulic brake systems, it was thought best to first have the S.A.E. formulate a suitable performance type brake fluid specification which would be available to all manufacturers, sales, and service organizations associated in any way with hydraulic brakes, and also would be a guide for the public to assure that they were getting safe brake fluids. An S.A.E. Brake Fluid Committee was formed in 1945 to write the needed specification.

The Ordnance 2-111 Specification was first studied and found to contain the basic requirements for a heavy duty all-purpose brake fluid; but, due to the scarcity and high cost of the basic materials needed to make heavy duty type brake fluids for commercial use, it was deemed advisable to also write a moderate duty brake fluid specification which would specify a fluid suitable for use in passenger cars and light trucks operating under moderate operating conditions.

The heavy duty and moderate duty brake specifications were approved by the S.A.E. Technical Committee as submitted by the Brake Fluid Committee in December, 1946, and the specifications were published in the 1947 S.A.E. Handbook.

It will be noted that the specifications cover only brake fluids of the non-mineral oil type. Until recently, non-mineral oily type fluids have been required for all automotive hydraulic brake controls produced in the U. S. If oil resisting synthetic rubber-like materials, such as we have today, had been available in the early 1920's, the non-mineral oil type brake fluids might never have been developed.

Several truck manufacturers are now offering hydraulic brake controls using a mineral oil. Therefore, with the great advancement being made in the development of rubber-like synthetic materials and mineral oils, it will behoove those interested in the continuation of the use of brake fluid to immediately devote considerable effort towards the further development of better brake fluids.

The accompanying chart lists the main requirements of the two S.A.E. specifications and also gives the properties of a so-called "ideal" brake fluid which the writer feels should be the goal towards which all manufacturers of brake fluids should direct their efforts.

Viscosity

In regards to viscosity there are two temperatures and corresponding viscosities specified in the S.A.E. Specifications (see chart). At 130 F a minimum viscosity of 3.5 centistokes is required. We all know that the thinner the fluid the more chance for leakage. More viscous fluids are to be preferred; (note the "ideal" fluid column calls for a 20 centistoke minimum viscosity) but, experience has shown that if care is taken to produce and to keep the vital parts and sealing surfaces in a good, clean condition, we can get by with such thin fluids. To date brake fluids as a whole have not had sufficiently high viscosity indexes to permit substantial raising of the high temperature viscosity without seriously increasing the low temperature viscosity. Further, there has always been a cost differential between diluents and oily base materials which has tended to influence the brake fluid manufacturers to load up their fluid formulations with diluents and to disregard high temperature viscosities.

The lowest temperature at which our commercial vehicles operate here in the U. S. was found to be about −40 F. The Brake Fluid Committee found through experience and actual tests in cars that a brake fluid with a viscosity of more than 2200 centistokes was definitely too sluggish to give responsive and equalized brake action. A change to 1800 centistokes maximum at −40 F has recently been approved by the Brake Fluid Committee.

BRAKE FLUID SPECIFICATIONS

TESTS	TEST LIMITS Spec. 70R2 Mod. Duty	Spec. 70R1 Heavy Duty	Ideal Spec.
Viscosity (at −40 F) Centistokes Max.	2200	2200	500
Viscosity (at 130 F) Centistokes Min.	3.5	3.5	20
Cold Test (6 days at −40 F)	.....	Flow in 5 sec No stratification No precipitation	.....
Cold Test (24 Hr at −20 F)	Flow in 5 sec No stratification Slight precipitation	.....	.....
Freezing Point (6 Hr at −60 F)	.....	Flow in 5 sec	Flow immediately No stratification No precipitation
Boiling Point Deg F Min.	230	300	500
Flash Point Deg F Min.	100	145	Non-inflammable
Water Tolerance (3—½% Water at 120 F and −10F)	No stratification Slight precipitation	.....	.....
Water Tolerance (3—½% at 140 and −40 F)	.....	Flow in 5 sec. No stratification No precipitation	.....
Water Tolerance (10% Water at 200 F and −60 F)	.....	.....	Flow immediately No stratification
Neutrality pH	5.0 to 9.5	6.0 to 9.5	7.0 to 8.0
Neutrality pH (After Corrosion Test)	5.0 to 9.5	6.0 to 9.5	7.0 to 8.0
Stability 295 F for 6 Hr Min B. P. Deg F	.....	295	.....
Stability (225 F for 6 Hr) Min B. P. Deg F	225	.....	.....
Stability (495 F for 6 Hr) Min. B. P. Deg F	.....	.....	495
Rubber Swelling (120 Hr at 158 F)	.005 to .050 Not tacky	.005 to .050 Not tacky	.....
Rubber Swelling (240 Hr. at 400 F) Synthetic Cups	.....	.....	.005 to .030 Not tacky
Compatability 50/50 Mixtures (24 Hr at 140 and 30 F)	No stratification No precipitation	No stratification No precipitation	No stratification No precipitation
Lubrication Stroking Test (158 F 500 psi, 150,000 Strokes)	No leaks, corrosions, galling, etc.	No leaks, corrosions, galling, etc.	.....
Lubrication Stroking Test (400 F 1500 psi, 500,000 Strokes)	.....	.....	No leaks, corrosions, galling, etc.
Lubrication (Pump Test)	.....	.....	Equivalent to S. A. E. No. 10 oil
Residue (14 days at 158 F) (In W. Cyl.)	No corrosion, gum or residue	No corrosion, gum or residue	No corrosion, gum or residue
Evaporation 48 Hr at 210 F percent Max.	85	80	20
Corrosion (120 Hr at 210 F) Mg per sq cm Max.			
Tinned Iron	0.7	0.7	None
Steel (S. A. E. 1010)	0.7	0.7	None
Aluminum (S. A. E. 24)	0.2	0.2	None
Cast Iron (S. A. E. 111)	0.7	0.7	None
Brass (S. A. E. 703)	0.5	0.5	
Odor	.....	.....	Odorless
Attack on Lacquer, Enamel etc.	.....	.....	No attack
Foaming	.....	.....	Very low
Color	.....	.....	Distinctive

Cold Tests

Many of the low temperature complaints with hydraulic brakes over the years have been due to the brake fluid freezing up after the car was exposed to low temperatures for some time. The cold tests in the specifications are to assure that fluids meeting the specification will not separate and freeze up after prolonged periods at low temperatures.

Boiling Point

Next on the list of test limits is boiling point. In view of the ever increasing brake temperatures mentioned previously, and the fact that hydraulic brake action is wholly dependent upon the brake fluid remaining in the non-compressible fluid state, the writer thinks that boiling point is the most important property of a brake fluid. The Brake Fluid Committee back in 1945 was also of the same opinion, and if it had not been deemed necessary to consider the economic aspects of the problem, the boiling point for the moderate duty specification would have been set much higher than the 230 F to give more factor of safety. The 300 F minimum boiling point required by the heavy duty Specification 70R1 is the same as that specified by the Army Specification 2-111. At the time the S.A.E. Specifications were written, the 300 F boiling point seemed adequate for severe duty brake service; but, today we find some car manufacturers demanding fluids with still higher boiling points. The ideal fluid calls for a 500 F minimum boiling point, which should give ample factor of safety for all hydraulic brakes for some time to come.

Flash Points

Of course, the ideal fluid would be non-inflammable as listed; however, there are so many more important properties to improve upon that it is doubtful if any real effort will be made to develop a non-inflammable automotive brake fluid.

(*Turn to page* 84, *please*)

Recent Developments in Sub-Zero Engine-Starting

OVER the past decade, with particular emphasis given by military requirements, Government and industry sponsored investigations have sought simple, effective, and reliable means of starting and operating internal combustion engines, both Diesel and gasoline, in frigid temperatures down to —65F. Engine manufacturers, in general, have favored methods which do not require major design changes, and which emphasize application of heat to minimize or eliminate possible damage resulting from forceful starting, and operation of the engine with congealed lubricants.

There are many and varied methods now in use to facilitate starting and operation at low temperatures. Dilution of the lubricating oil by gasoline or kerosene is perhaps one of the earliest schemes. Although it is more widely used in aircraft engines, many operators

By FRED A. TRAINO
Consulting Engineer
formerly of
Wright Air Development Center

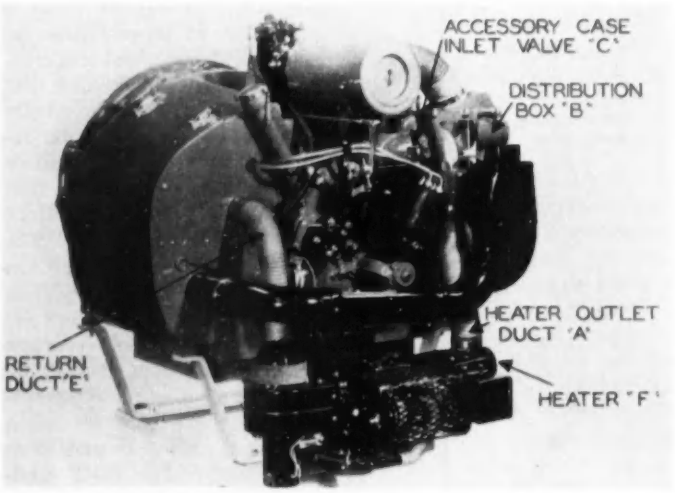


Fig. 1—Heater and ducts mounted at accessory end of engine provided with facilities for internal preheating.

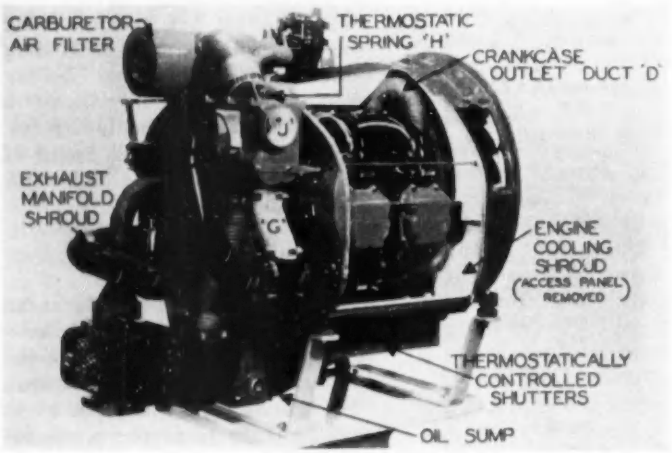


Fig. 2—View of engine and preheating facilities with access panel removed from engine cooling shroud.

of ground equipment resort to oil dilution for lack of something better. Due to variables such as changes in ambient temperatures, changes in the quantity of oil in the crankcase, and changes in viscosity of the oil, over dilution as well as under dilution is frequently encountered. To these variables must be added the effect of human error due to carelessness or inexperience on the part of the operator in forgetting to dilute prior to shut down or misjudging the quantity of diluent. Even though elaborate means of avoiding all such variables may be employed, vaporization of the fuel still remains to be accomplished at extremely low temperatures. In aircraft applications, there is considerable ground support equipment such as heaters, and electrical sources of power to aid starting. In most cases such elaborate support is not economical as applied to vehicles and miscellaneous engine powered equipment.

Liquid Cooled Engines

Many liquid-cooled engines required to operate in sub-zero temperatures are equipped with coolant heaters. These

heaters usually are connected to the engine coolant system so as to cause flow of heated coolant by thermosyphoning. Due to the increased viscosity of the ethylene glycol-water mixture used as coolant, special provisions must be made to cause flow at ambient temperatures below −40F. Although this type of heating conditions the cylinders, combustion chambers, and sump oil, heat does not readily reach the congealed oil at the main and connecting rod bearings and accessory drives unless the pre-heating is continued for long periods of time, usually well over an hour for the average cast iron engine. Most installations involve complex plumbing systems and usually require complete drainage of the coolant even for minor repairs.

Aircooled Engines

Aircooled engines have employed contaminated air heaters. Hot combustion gases from a gasoline heater are distributed to various critical areas of the engine, including the oil sump, and to other components. As in the case of coolant heaters, this system also involves an undesirable degree of extraneous ducting (usually stainless steel). Distribution ducts particularly at the heater outlet operating at temperatures between 1100F and 1400F present a definite fire hazard. Products of combustion in contact with the engine build up considerable deposits over extended use of the heater. This type of heater has been found to be completely undesirable and its application in newer equipment has been discontinued.

Specially developed Arctic oil and fuel are being employed in some instances. Arctic oil most commonly used is grade 5W in accordance with Specification MIL-0-10295. Gasoline used is according to Specification MIL-G-3056, grade C. having a Reid vapor pressure up to 14 psi. Special cartridges or capsules of highly volatile fuel are used for Diesels. Use of the special oil and fuel reportedly permits starting without preheating down to a temperature of −40F. Below this temperature application of heat is usually necessary. Although starting is facilitated with the Arctic oil, high oil consumption results during operation. Extended operation under such conditions may require frequent maintenance due to fouled spark plugs and excessive carbon deposits in the combustion chambers. Also, cold starting of an engine causes increased sludge deposits because of the condensation occurring in the engine crankcase during the warmup period. Decreased life of the engine as well as failures may be expected since the lubricating qualities of such oil is questionable under operating temperatures.

Pour point depressants and special cartridges or capsules of highly volatile fuels are among the other miscellaneous schemes. It has also been reported that open fires have been built under the crankcase of large engines. Of course, the undersirability and dangers of such a method are obvious.

Disadvantages of Some Systems

Tests and service experience have shown that the systems outlined above do not fully accomplish the desired objective. None of the systems outlined results in a practical reduction of starting torque within a minimum period of time. Formation of sludge due to condensation of moisture on cold walls after starting remains prevalent. Consistent, reliable starts without "nursing" have not been obtained below −40F within a reasonable period of time. In the case of Diesel engines, starting troubles have been common at temperatures as high as 0F. Regardless of any of the systems used, batteries must be heated to a minimum temperature permitting a discharge capacity commensurate with the torque requirements under the particular condition. Thus, by reducing the starting torque of an engine less discharge capacity is required of the battery. Much has been published on the aforementioned methods of winterization by various groups conducting low temperature studies and investigations. It must be recognized that each of the concepts outlined represents considerable painstaking efforts and continued exposure in laboratories and in the field by such groups working toward a common objective. Hence, the summary of outstanding disadvantages is not a condemnation of such efforts but instead, should reflect a process and period of fruitful exploration of the problems involved.

Research Program

Early in 1947, a research and development program was initiated by the Equipment Laboratory, of the Air Research & Development Command's Wright Air Development Center, Wright-Patterson Air Force Base, to determine possibilities and practical application of introducing heated clean air internally through engines for preheating. This concept was decided upon after reviewing the disadvantages and shortcomings of all known systems and, in addition, considering numerous other possibilities such as circulating warm oil through the engine, and heating by internal radiation and conduction. The overall objectives were set forth as follows:

1. Provide consistent, instant starting after a preheating period of 30 min or less at −65F through the use of only a throttle and choke control.

2. Reduce installation complexities to a practical minimum.

3. Permit starting and operation without the need for special Arctic fuel or lubricant.

4. Reduce starting torque to a practical minimum value to make the temperature of the battery less critical.

5. Heat to be obtained from a small self-contained fresh air heater of high output preferably mounted on the engine.

Engines Used for Tests

Initial research was conducted with a two cyl, aircooled, aluminum engine of approximately 12 hp. Heat transfer coefficients were determined and formulae were derived for calculating the quantity of air required to heat a given engine over a particular time

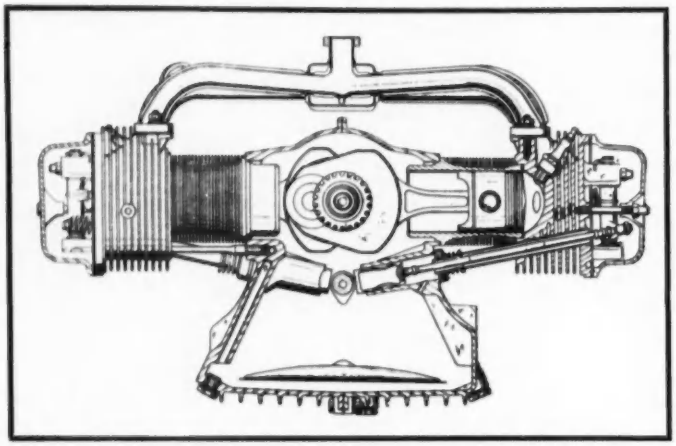
(*Turn to page* 94, *please*)

Unique

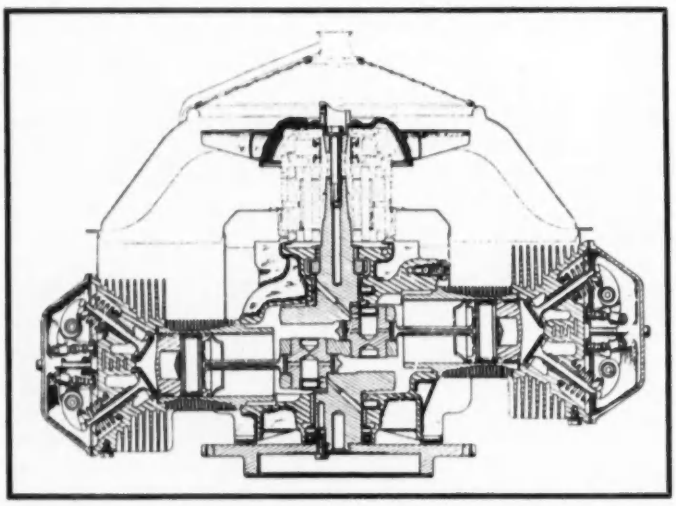
ENGINEERING FEATURES . . . *of Small* . . .

INDICATIONS are that an important section of the buying public in Europe is prepared to sacrifice all the frills which have grown up around the modern automobile, all ideas of style, and a certain amount of speed, for a vehicle which is inexpensive to purchase, economical in maintenance, low in operating costs, and capable of a much broader application than that of the average passenger-carrying automobile.

Citroen, in France, was the first to realize this, and was carrying out development work on a simplified type of automobile while the country was under enemy occupation. His twin cylinder, aircooled, front wheel drive car was revealed at the end of 1949, but production at first appeared to have been voluntarily restricted, for a long time foreign markets were not supplied, and at the present time, with an output of 140 per day, demand is not being met. This is the only automobile in Europe selling for more second-hand than new.



Transverse cutaway view of the two-cyl Citroen aircooled engine.



Longitudinal section of the Citroen engine. Note the built-up crankshaft.

As taxation is tied up in the price of gasoline in some form or other throughout the world, an essential condition was 58 miles to the American gallon, with a capacity of four passengers and baggage and the ability to carry goods in the place of passengers. The speed requirement was limited to 40 miles per hour. In working out this design the engineers were not influenced by the four and six-cylinder water-cooled front-wheel drive cars then in production.

A piston displacement of 22.88 cu in. was decided upon as the most suitable, the two horizontal cylinders having a bore and stroke of 62 by 62 mm (2.44 by 2.44 in.). Output was held down to nine hp at 3500 rpm. With a wheelbase of 93.5 in. and a tread of 49.5 in. front and rear, width inside the car is 43 to 45.5 in.

Unlike other Citroen models, the small car has a separate chassis frame to which a very light body is bolted. The frame is composed of two box-section side rails and four box-section cross members. These are assembled by welding, then covered by a sheet-metal flooring above and below, forming a complete box platform. There are two tubular cross members, both of which carry the suspension arms, while the one at the front also supports the rack and pinion steering gear.

The aluminum alloy crankcase is split vertically and the crankshaft is in five parts, assembled hot in a press. Connecting rods are one-piece forgings. Cylin-

. . FRENCH CAR . . .

Citroen four-passenger car. The roof and rear panel are made of waterproof canvas held in grooves along each edge, and can be opened as shown.

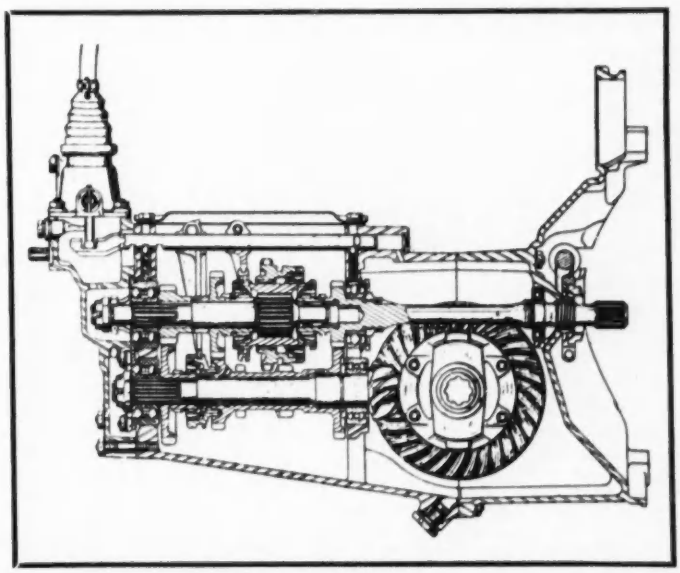
By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

ders are cast iron, and external diameter of the fins is uniform, but their depth varies because of variation of the thickness of the cylinder walls. Plain bearings are used for the connecting rods and for the crankshaft, with a bronze bushing for the piston pin. Aluminum alloy is used for the cylinder heads, which have hemispheric combustion chambers with a compression ratio of 6.2 to 1 and inclined valves at an angle of 70 deg one to the other. Non-removable valve guides and seats are inserted. A plain copper gasket is used between cylinder head and barrel, and four studs unite the head to the barrel and the barrel to the crankcase. The camshaft is mounted below the crankshaft, and features a metal gear with automatic take-up of play. The main gear is steel, fastened to the camshaft, while a secondary cast-iron gear is mounted free on the hub and connected to the main pinion by three small springs, allowing of a slight angular displacement in relattion one to the other. In assembly, the springs are put under tension by an advance of one tooth of the free gear in relation to the fixed camshaft gear. By reason of its engagement with the crankshaft pinion, the free-mounted gear cannot return to its original position. The spring tension prevents play of the camshaft gear in the crankshaft pinion, automatically taking up backlash.

The pushrods, carried in tubes, are below the cylinders, and intake and exhaust manifolds are above. The carburetor is an inverted Solex 22 ZACI, fed in the usual manner by a mechanical pump from a seven-gallon tank at the rear of the car. Maximum torque is 16.6 lb-ft at 1800 rpm. The central portion of the manifold is heated by a by-pass from one of the exhaust pipes, and there is a very simple arrangement to carry warm air into the car. The ignition system does not have a distributor. The breaker cam, with automatic centrifugal advance, is on one end of the camshaft, and through a two-lead coil it provides sparks simultaneously to both cylinders, but obviously ignites only the fuel-air mixture of the cylinder under compression. Cooling is by means of a fan on the end of the crankshaft and there is an oil cooler behind the fan. The engine is capable of operating indefinitely under full load as a stationary unit.

The power plant, consisting of engine, single plate clutch and four speed transmission, has three-point rubber block attachment to the chassis. All gears are indirect; the fourth is an overdrive, and all but low gear are synchromesh. The open drive shafts have an open universal at each end, but with a view to simplicity these are not constant-velocity type. To reduce unsprung weight the forward brakes are inboard. They have a drum diameter of 7.8 in. and a width of 1.55 in.

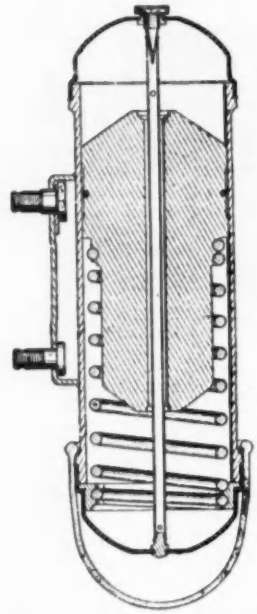
One of the most original and successful features of



Transmission and final drive of the Citroen car.

this automobile is the suspension system. The four wheels are independent, the two on each side being interconnected to coil springs within a cylindrical chamber outside the chassis frame. Each spring is connected up to a suspension arm carrying the wheel and having a roller bearing mounted on the cross tube bolted to the chassis. A friction disk shock absorber is incorporated in this mounting. An additional feature is the use of canisters on the wheel arms, containing sealed-in harmonic balancers. The spring supported, sliding element in the canister weighs about 13 lb. To control the sliding movement, the lower portion of the canister forms an oil reservoir and at each movement oil must pass through an axial tube from one end to the other. The periodicity of the balancer is different from that of the main suspension unit, so they act against each other. The degree of flexibility is high, and the variation with different loads is so considerable that adjustable angle of the headlights has to be provided for.

The bodywork is simple and light, for the whole of the load is carried on the chassis frame. The roof and rear panel consist of waterproof canvas held in grooves along each edge and capable of being folded down. This has been adopted more with the object of allowing of bulky objects being carried than by reason of low cost. The four seats consist of light steel tube frames across which rubber bands are stretched and covered by padded cloth. The seats are quickly adjustable and can be completely removed. Curb weight of the car is 1100 lb.



Citroen harmonic balancer. One of these units is attached to each wheel support arm.

Selling at just under $1000, the small Citroen is the lowest priced car on the French market. A very cautious policy has been adopted by the French company, but now that it has been proved that a restricted performance all-service automobile meets with the approval of a much larger range of buyers than the farming classes to which it was first offered, increased output may be expected.

Up to the present no other automobile quite comes into the same class. It is known that Fiat is working on a low-priced automobile, with a piston displacement around 22 cu in., but no decision has been taken regarding its production. Ferrari has completed designs of a two-seater weighing 770 lb, powered by a two-stroke front-wheel drive engine with direct injection. The Ferrari shops being unsuitable for quantity production, negotiations are in hand for building this automobile in big engineering works in Northern Italy.

Postwar Germany has paid a lot of attention to small automobiles, going for the two-stroke engine, usually with two cylinders, with piston displacement varying from 24 to 40 cu in. These all break away from conventional design by having front wheel drive, independent suspension all round and either frameless or central backbone construction. In all cases it has been sought to retain the appearance of a full-sized automobile, scaled down. Apart from the Citroen ultra-simplicity, it is significant that certain European makers are attempting to attract a new layer of buyers by eliminating as many frills as possible. This has been done by Renault and Simca in France and by Ford in Germany. All state that the reception given these "plain" automobiles is very satisfactory.

• • •

Plymouth is Safest

The National Safety Council's Award of Honor, the nation's highest industrial safety citation, has been awarded to the Plymouth plant for its safety record during 1952, it was announced today by John P. Mansfield, vice-president of Chrysler Corp. and president of Plymouth Div.

The award was based on Plymouth's frequency rate of 2.2 lost-time accidents per million man-hours worked, and a severity rate of 0.05 of one day lost due to accidents per thousand man hours worked. This compares with national automotive industry figures of 3.62 lost time accidents per million man-hours worked in 1952, and an overall industry severity rate of 0.350. The National Safety Council figures for all Detroit industry for the year 1952 showed a frequency rate of 4.64 lost time accidents, and a severity rate of 0.380.

More Iron Powder

A new patented process for the production of powdered iron has been perfected by Republic Steel Corp. Commercial production of iron powder will begin in a new plant to be built soon in Toledo, O.

The plant will have a capacity of 50,000 lb per day, a substantial part of the nation's iron powder market.

Consideration is being given to the production, by a variation of the process, of sponge iron which might be used to produce tool steel and similar high grade steels. Experiments also show promise of producing nickel and manganese from low grade ores.

Republic will build the iron powder plant on land recently acquired, near the Toledo refinery of Sun Oil where facilities are being erected by Sun for producing high octane gasoline, to be completed in October. Hydrogen for the Republic process will be a by-product to be utilized by Sun.

Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.

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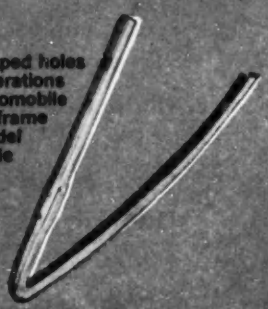

Seven irregular shaped holes and two trimming operations complete this automobile door inner window frame in one setup. Model changes can be made at little expense.

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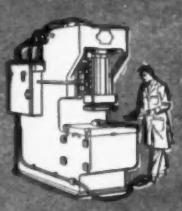
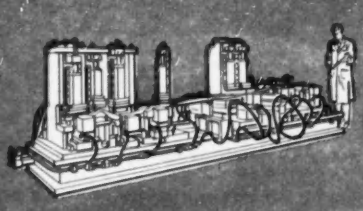
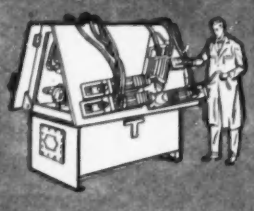


General Purpose Gap Frame Piercing Press



Automotive Frame Piercing Machine



Automotive Inner Window Frame Piercing Machine

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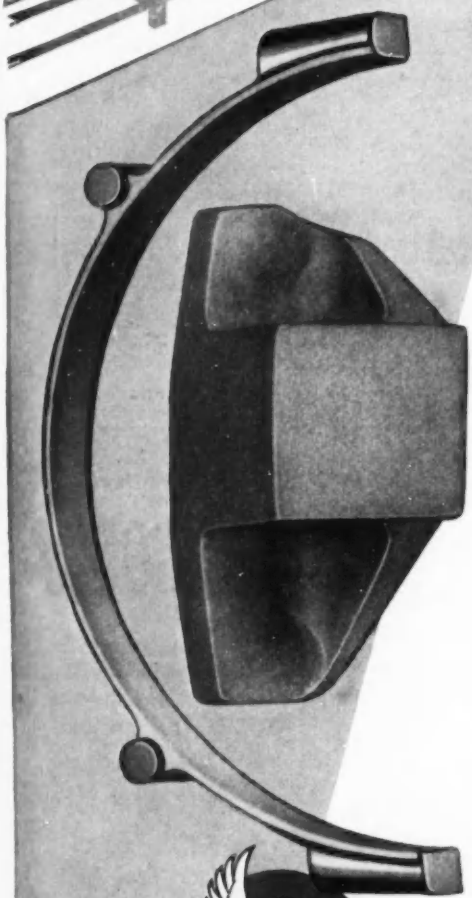

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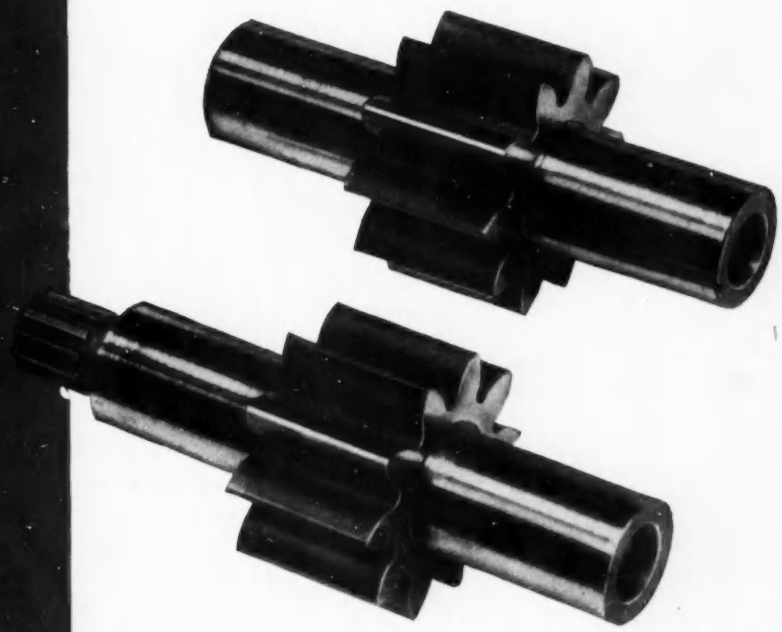

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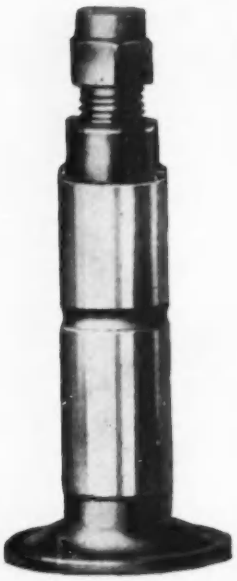

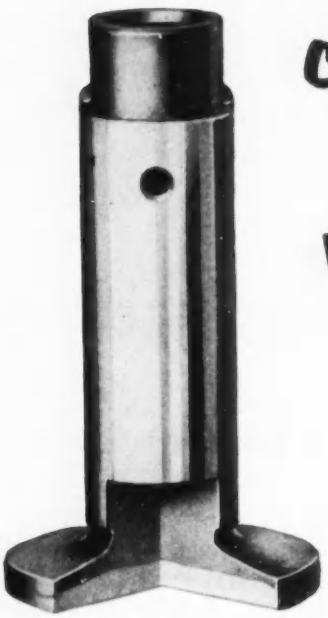

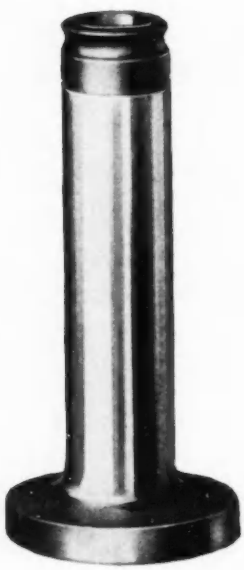

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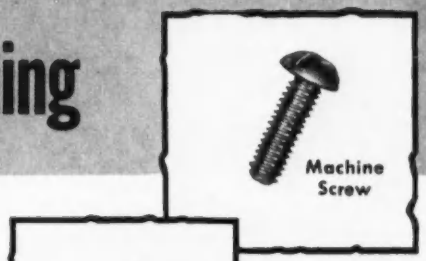

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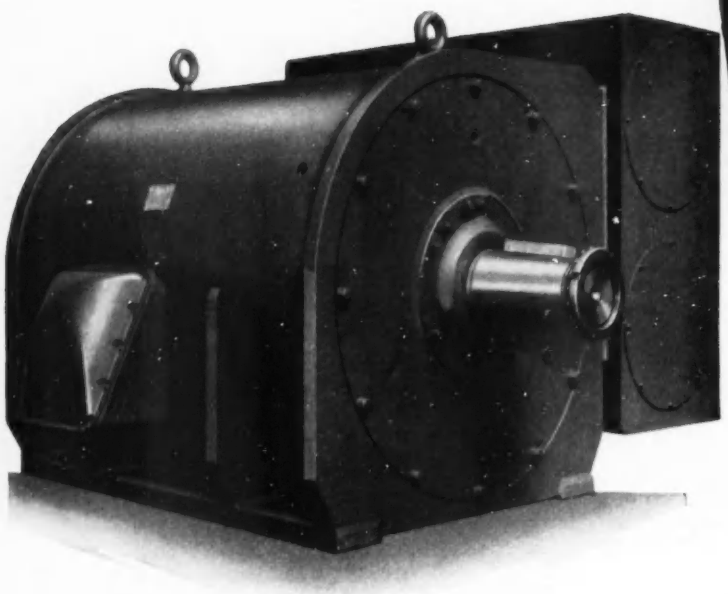

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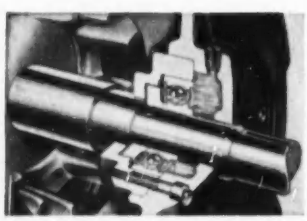

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The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1458K

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Magnetic Amplifiers Described and Discussed at Symposium Held by Westinghouse Electric Corp. New Government Set-up for Idle Tools.

Magnetic Amplifier Symposium

Magnetic amplifiers, described as being among the latest devices to help speed complete factory automation, were the subject of a symposium held recently by Westinghouse Electric Corp., Pittsburgh, Pa., in New York City. The meeting was broken down into three categories: what is the magnetic amplifier; how does it work; and where it can be used.

Dr. R. A. Ramey, manager, magnetic development section, gave a dissertation on the operating principles of the amplifier. In essence it was explained that the magnetic amplifier is a unit which utilizes a small amount of current from a controlled source to control a much larger amount of current which is being used to operate a given electrical load. Dr. Ramey said that the trend is to build magnetic amplifiers with intrinsically high gain and to throw away a good part of this gain to achieve rapid response time. This search for effective amplifiers encourages the development of better magnetic materials and rectifiers so that very high intrinsic gains can be obtained.

Speaking on the construction of the device, L. R. Hill, manager, materials engineering department, stated that the lack of satisfactory basic materials delayed widespread application of the device until recently, although the fundamental operative principles were known and applied by manufacturers of German military equipment before WW II. The material developed by Westinghouse for the magnetic core of the amplifier is known as Hipernik V. Unfortunately, Mr. Hill stated, high performance magnetic material is extremely sensitive to small mechanical stresses, temperature changes, and vibration. Protection against strains which develop when copper windings are applied to the magnetic material, low and high temperatures, and mechanical vibration require a high degree of isolation which is achieved by boxing the cores, filling the boxes with temperature insensitive damping fluids, and then potting the wound units in a rigid insulation material that is stable in respect to temperature.

Concerning various uses in industry, M. H. Fisher, manager, general mill section, and R. E. Hull, control engineering, presented a paper which pointed out how the device can be used to automate machinery. It was stated that in the steel, paper, lumber, materials handling, rubber and textile industries, 57 jobs have been sold involving 122 different magnetic amplifier regulators ranging from voltage regulators for a 24,000 kw rectifier on a hot strip mill to three hp tension regulators on a textile slasher. Seventeen of the jobs have been installed and are now in operation.

More On Russian Tools

J. Mannin, writing on the Russian machine tool industry in the English publication *The Engineers Digest*, states that the central planning of Russian machine tool development programs encourages attempts to establish criteria for quality applicable to a large number of designs. Among the currently prominent problems, much emphasis is placed on a reduction in weight. Some typical weight-power ratios for Soviet engine lathes are 0.32 tons per kw for a 1934 design and 0.24 tons per kw for 1949 model. Horizontal milling machines of Soviet origin range from 0.34 tons per kw to 0.19 tons per kw; cylindrical grinding machines from 0.38 to 0.35. (*Turn to page* 140, *please*)

METALWORKING MACHINERY (EXCEPT MACHINE TOOLS)
QUANTITY AND VALUE OF SHIPMENTS BY CLASS OF PRODUCT, 1950, 1951, AND 1952

(Value of figures in thousands of dollars)

Class of product	1952		1951*		1950	
	Number	Value f.o.b. plant	Number	Value f.o.b. plant	Number	Value f.o.b. Number
METALWORKING MACHINERY, TOTAL	...	$250.026	...	$214,107	...	$155,007
Presses (including forging)	17,269	131,741	20,033	106,625	14,998	74,796
Forging machines (except presses)	1,262	16,366	1,367	15,354	1,248	9,953
Punching and shearing machines (power)	4,532	28,081	4,796	26,549	3,981	18,778
Punching and shearing machines (manual)	4,460	1,113	5,390	1,349	5,148	1,072
Bending and forming machines (power)	6,581	35,338	6,372	27,409	6,094	20,209
Bending and forming machines (manual)	15,971	3,206	15,140	3,031	16,677	2,824
Riveting machines (except hand-held portable type)	4,556	7,327	3,354	4,279	3,319	3,401
Metal-container making machines	1,297	14,003	1,974	15,340	2,122	12,469
Die-casting machines	229	3,422	294	4,707	313	4,694
Wire-weaving and wire-fabricating machines	865	3,792	913	4,487	572	2,849
Drawing machines and draw benches	526	5,637	510	4,977	374	3,962

*Revised.

Source: U. S. Dept. of Commerce.

EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

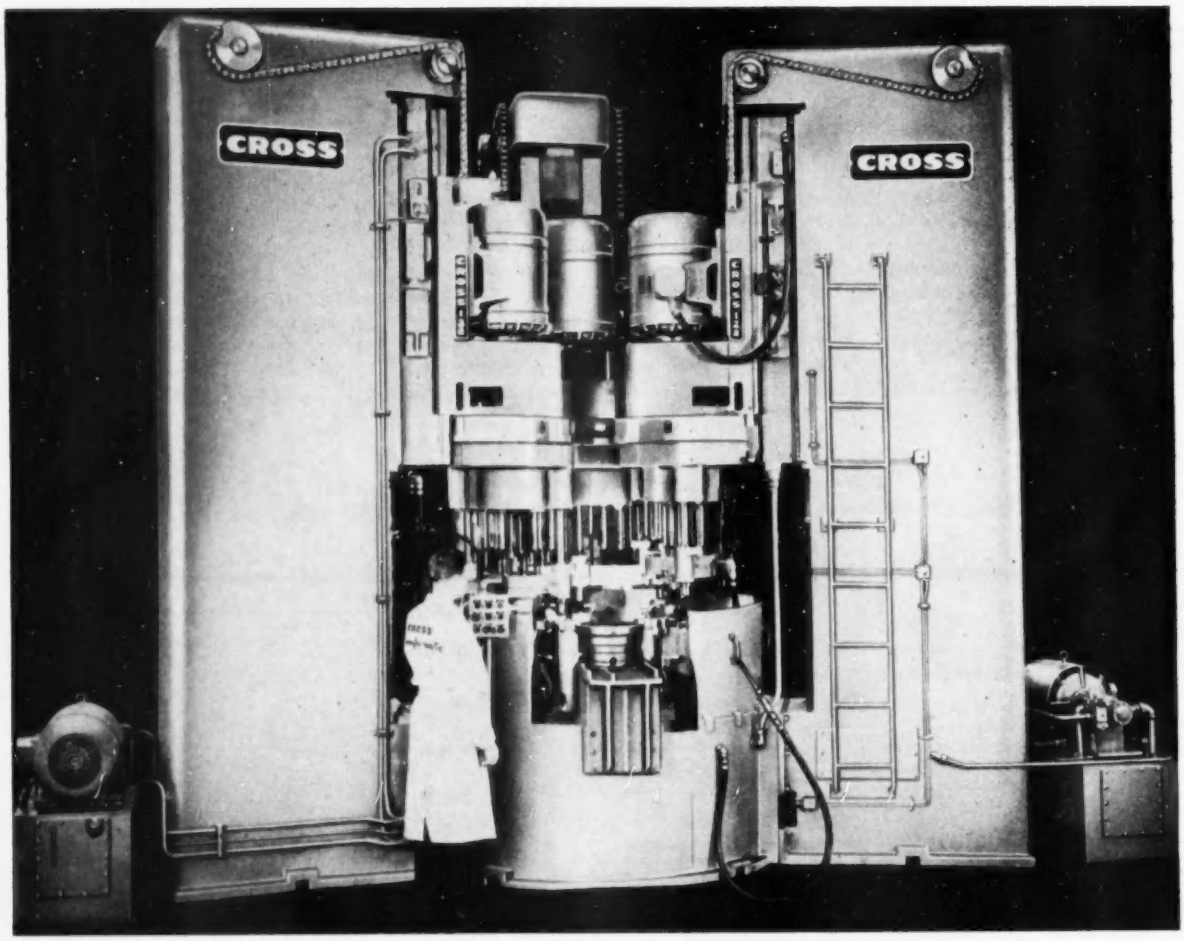
Machine Drills and Reams Diesel Locomotive Cylinder Heads

A special machine for drilling and reaming Diesel locomotive cylinder heads has been announced. The cylinder blocks are finished at the rate of 50 per hour at 100 per cent efficiency.

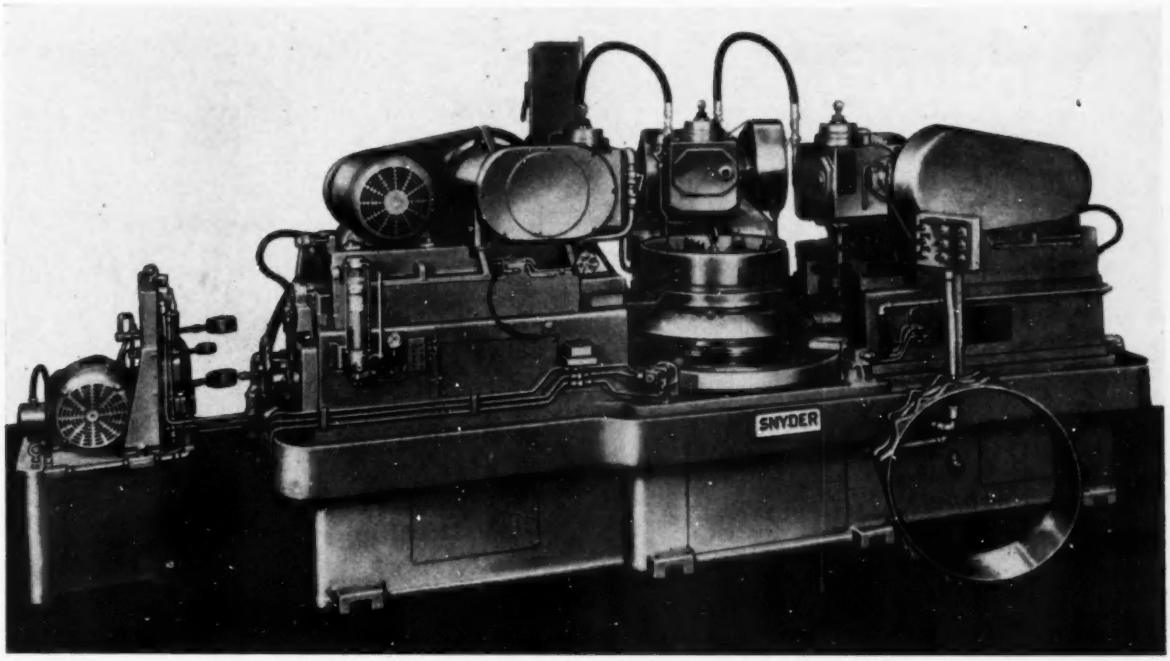
Seven stations are incorporated in the machine—No. 1 for loading and unloading; No. 2 for drilling 13 holes; No. 3 for drilling 11 holes and spotfacing one hole; No. 4 for drilling 12 holes; No. 5 for drilling two holes, core drilling and chamfering three holes; No. 6 for reaming nine holes, chamfering six holes and forming two spherical seats; No. 7 for reaming nine holes, chamfering one hole and forming two spherical seats.

The machine utilizes a fluid motor driven index table. Other features include hydraulic feed and rapid traverse, hardened an ground ways, and automatic lubrication. Construction is to Joint Industry Conference standards. *The Cross Co.*

Circle 66 on page 73 for more data



Cross seven station machine for drilling and reaming Diesel cylinder heads.



Snyder automatic machine for processing jet engine parts.

Jet Engine Compressor Casings Machined Automatically

For processing compressor casings for jet engines, an automatic machine has been engineered.

The workpiece is a thin-walled cylinder made from one of the tougher stainless steels. It has four rows of lugs projecting from the outside like fins. The operation is to profile these lugs by milling to a depth of 1⅝ in. at the extreme. Milling is done in three steps, two rough cuts and one finish cut.

This machine consists of a fixture mounted on a rotary table driven by a hydraulic fluid motor. Spaced around the table are three-way type milling units, each controlled by a Turchan follower hydraulic system. One of the units does the profiling of all four rows of lugs and the other two units cut off some of the lugs at different intervals to complete the finished part.

The fixture locates the part from an O.D. at one end and clamps and thoroughly supports the part by means of four expanding jaws on the I.D. of the part. Four toe clamps hold the part down in the pilot ring.

For the Turchan system the tracer valve projects from the front of the unit between the ways. In the advance position it contacts a template which is mounted on the rotary table just beneath the fixture.

When the workpiece is in position and the starter button is pressed, all three milling units rapidly advance and the profile unit goes into feed before the cutter contacts the work. The unit continues to feed in until the follower on the tracer valve has contacted the template and the table begins to rotate. Meantime, the other two units have traveled in until the followers of their tracer valves have contacted their respective templates.

When the part has made one complete reolution, the first rough cut is complete. Adjustments are made on all three milling units to retract the tracer valve with respect to the cutter. This gives the cutter more infeed on the next cut. The cycle is then repeated and the milling unit is again advanced and, finally, the finish cut is taken. Loading and clamping takes about six min, each of the three cuts 37 min, each of the three tool settings four min, unclamping and unloading about six min giving a total time cycle of about 135 min. *Snyder Tool & Engineering Co.*

Circle 67 on page 73 for more data

Laboratory Type Screen Rooms

The latest of a line of screen rooms features what is referred to as Uniframe construction. These screen rooms of the laboratory type are made with double copper screen material for maximum shielding efficiency. Tests have shown attenuations as high as 146 db and a range of 142-146 db is guaranteed, the maker states.

Like previous models, Uniframe screen rooms are entirely portable, being made in sections, easily assembled or taken down with only a screwdriver and a wrench. Metal-to-metal contacts are maintained by low impedance pressure contacting. *Erik A. Lindgren & Associates.*

Circle 68 on page 73 for more data

(*Turn to next page, please*)

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

(*Continued from page 65*)

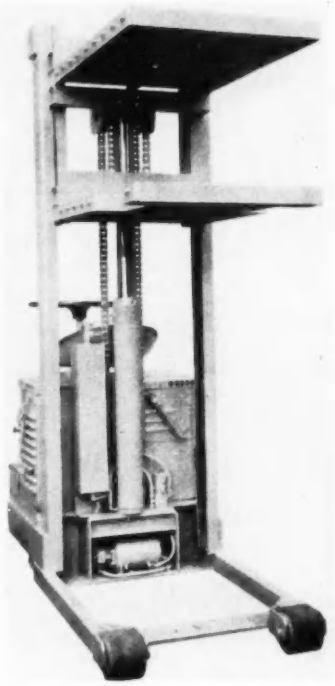
Tier Lift Truck Features Gas-Electric Drive

The recently designed Load-Mobile tier lift truck utilizes a gas-electric drive which consists of a small 12 hp, four cyl, four cycle gas engine driving a 12 d-c generator. In this particular installation, the maker provides a three-speed automatic control, which permits operation without shock from sudden starting. Acceleration is predetermined and adjusted. When the foot pedal is depressed to the desired speed point, the automatic control takes over from there.

Although the illustrated truck is for handling dies and the like, a tier lift truck for skids and pallets is available. It is available in either the open end or straddle type.

They are made in capacities up to 4000 lb and widths of 26 in. or more. The length of the platform can be anywhere from 30 in. to 48 in.; available for 6½, 7½, 9½ and 11½ in. skid platforms. Weight is only 2700 lb, including battery or gas-electric unit. Speeds are up to five mph. *Market Forge Co.*

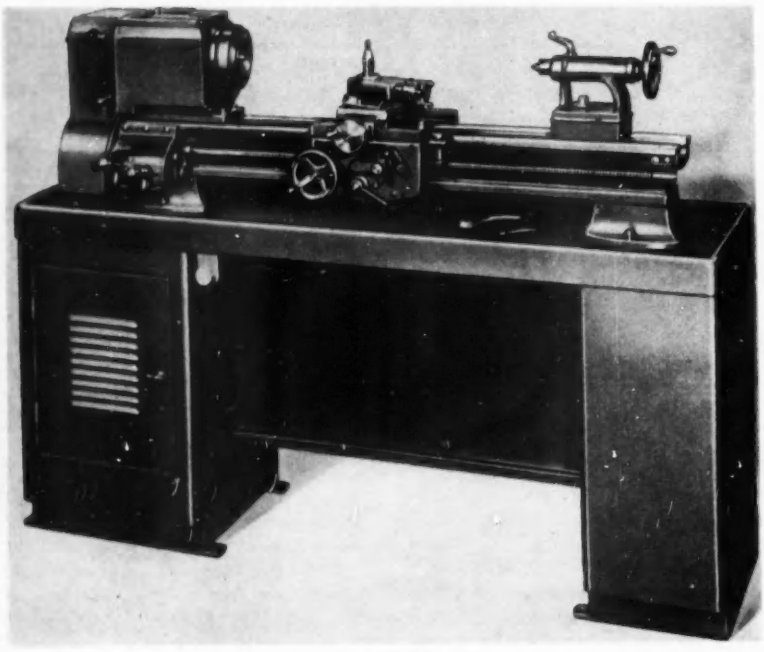
Circle 69 on page 73 for more data



Market Forge gas-electric tier-lift truck.

Lathe Features Large Capacity for Size

Now in production is a 12 in. lathe which features a heavy headstock; double V-belt outboard drive; ball bearing mounted spindle; and a convenient, precision-built carriage. Indicative of its capacity are such specifications as the 12 in. swing-over bed and saddle wings, one in. collet capacity, 1⅝ in. spindle hole, and center distances of 23 in. and 35 in.



Logan 12 in. lathe.

The lathe is said to hog out heavy cuts, handle high speed production runs, and hold sensitive tool room tolerances. Mounted on double rows of oversize, wide-spaced ball bearings at each end of the headstock, the spindle is claimed to provide sustained accuracy through 16 speeds, from 38 to 1260 rpm. The carriage has large dials and a convenient lever-operated disk-type clutch. Precision ground top surfaces on the cross slide and saddle permit mounting fixtures and the use of magnetic indicators. Cross slide bearing surfaces are extra wide and long. The compound is massive, for rigid tool support. The apron operates in a bath of oil.

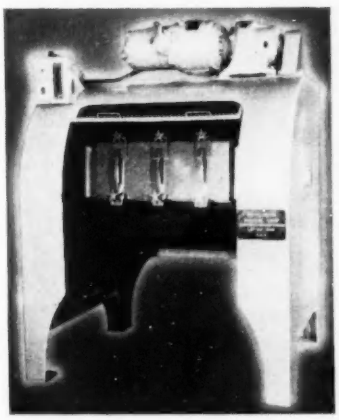
The bed is of heavily ribbed, balanced construction with two V-ways and two flat ways precision ground to a tolerance of 0.0005 in. *Logan Engineering Co.*

Circle 70 on page 73 for more data

2000 Lb Capacity Barrel Tumbler

Development of a line of deburring equipment has been announced. Known as the BurrMaster, this barrel tumbler removes welding slag, flame cutting slag, burrs and rust from weldments and machined parts. Actual time study records show that the majority of items processed can be deburred in one-third the time necessary to process by hand. Removal of welding and flame cutting slag, on most items, is accomplished in one-tenth the time.

The unit is of welded steel construction with the exception of the barrel door which is made of aluminum. Both the barrel and barrel door have neoprene linings. Under actual test for six months, a BurrMaster was operated 16 hr per day without any sign of barrel wear, according to the producer.



White-Roth barrel tumbler, the BurrMaster

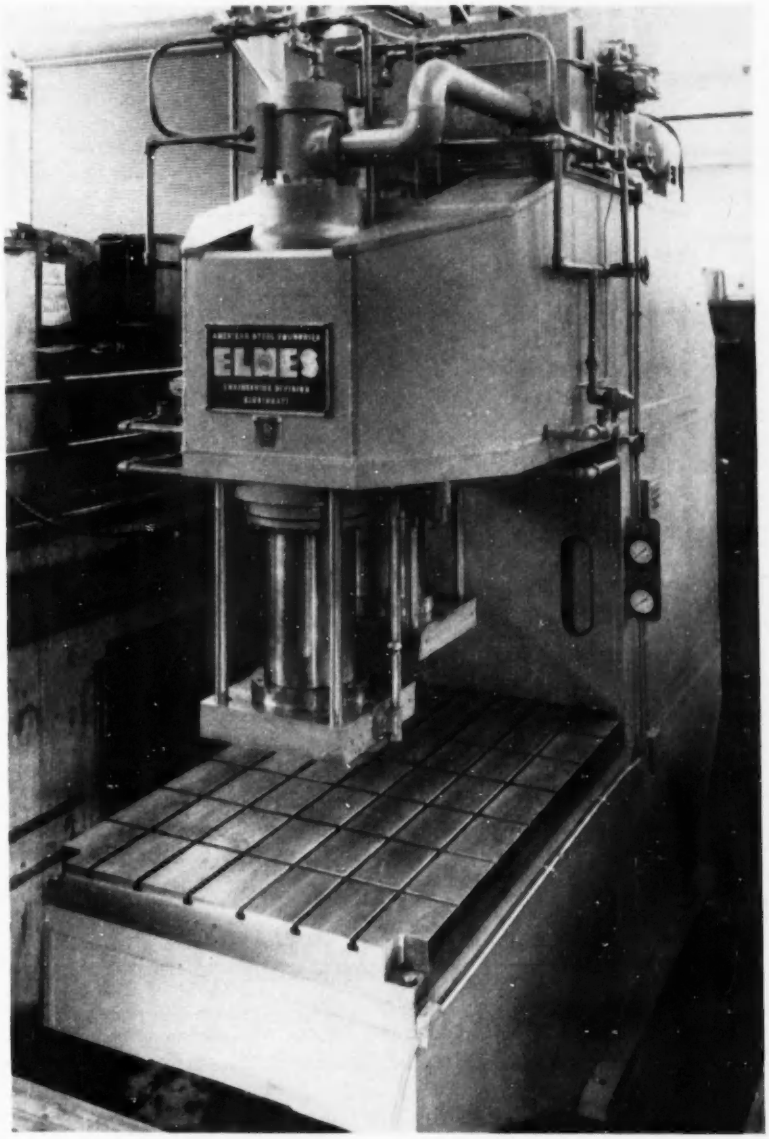
The large BurrMaster barrel is 32 in. diam and 48 in. long, having a total load capacity of 2000 lb. Overall dimensions of the unit are 72 in. high and 62 in. long.

For safe operation, all moving parts are completely enclosed. The perforated, exterior barrel guard is locked in the lowered position during operation.

The BurrMaster with variable speed drive can be set at any desired barrel rpm from five to 30. Push button control makes it easy to position barrel door for convenient unloading and draining. The self-locking drive prevents the barrel from moving during loading or unloading. An electric timer leaves operator free during deburring cycle and automatically shuts off the equipment when the cycle is completed. *White-Roth Machine Corp.*

Circle 72 on page 73 for more data

Two 300 Ton Presses Make Up 600 Ton Hydraulic C Frame Press



This recently built hydraulic flanging press is so designed that both cylinder assemblies can be operated in unison, providing a total frame capacity of 600 tons, or each 300 ton cylinder assembly can be operated as an individual press completely independent of the other cylinder assembly.

Power for each cylinder is supplied by an individual hydraulic pump. Either or both pumps may be operated depending on whether the press is being used as a dual ram press or as a single ram press. Control is provided through a single pendant station operating on a swivel. (American Steel Foundries, Elmes Engineering Div.)

Circle 71 on page 73 for more data

(*Turn to next page, please*)

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

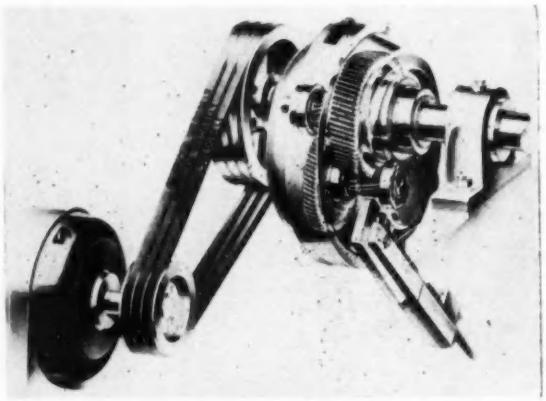
(Continued from page 67)

Shaft-Mounted Speed Reducer

Under the name Shaft-King, a 13-to-1 ratio series of shaft-mounted speed reduction units has been introduced. Retaining all the advanced features of the original 20-to-1 series, the latest Shaft-King units extend the advantages of V-belt drives to cover a wide variety of slow-speed equipment.

Adaptable to any shaft-size up to 3 15/16 in., the speed reducers are said to be exceedingly compact, requiring only standard shaft lengths (twice the shaft diameter plus clearance) to be mounted directly on the shaft of the driven machine.

Two trains of flame-hardened helical gears reduce the driven shaft speed to obtain a 13-to-1 ratio. Gearing and bearings are continuously splash lubricated by the high speed gear and the counter-shaft pinion which operate in an oil reservoir in the lower third of the exclusive three-wall housing.



American "Shaft-King" speed reducer.

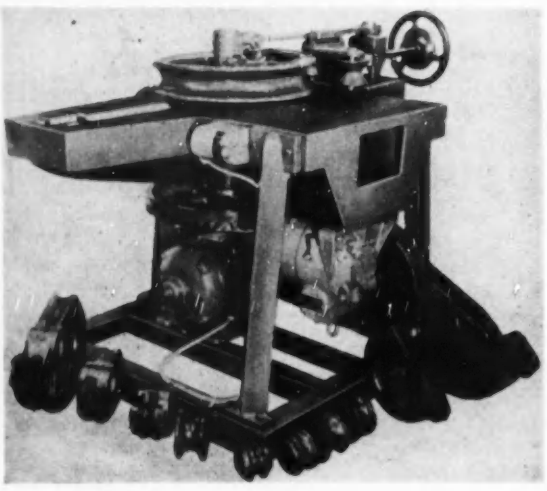
Another Shaft-King construction feature is the concentric shaft design which places both the input and output shaft above the oil level. Additional features include a leakproof, anti-friction oil sealing system, interchangeable split tapered bushings, and the use of both ball bearings and tapered roller bearings.

For protection against sudden overloads or jamming conditions, Shaft-King speed reducers can be equipped with the torque-arm overload release. As a safety precaution on applications where reversing must be prevented, the speed reducers may also be equipped with an internal backstop. Both the overload release and backstop features are optional. *American Pulley Co.*

Circle 73 on page 73 for more data

Bender Handles ½ In. to Two In. Pipe

The Model 2PBR pipe bender has been engineered to bend ½ in. to 2 in. U. S. standard pipe at radii approximately five times the pipe size, up to 180 deg. The minimum radius of bend it will handle is five times the pipe size; the maximum radius of bend, 13 in.



American pipe bending machine, Model 2 PBR.

This machine will handle bends up to 1½ in. extra heavy and 1½ in. double extra heavy; however, it is not designed to be used for heavier bends. Its capacity covers a wide range in general use for maintenance bends, indirect heating, conduit bends and for general plant and property maintenance where radii within the capacity of the machine can be used to eliminate fittings and to speed up piping installations.

The 2PBR machine is shipped and priced as a complete unit. It includes as standard a two hp motor and drum type reversing controller as well as all rollers and quadrants for the fixed radius bends availabe within the capacity of the machine. The standard 2PBR is complete and ready to run; no extras are necessary. *The American Pipe Bending Machine Co.*

Circle 74 on page 73 for more data

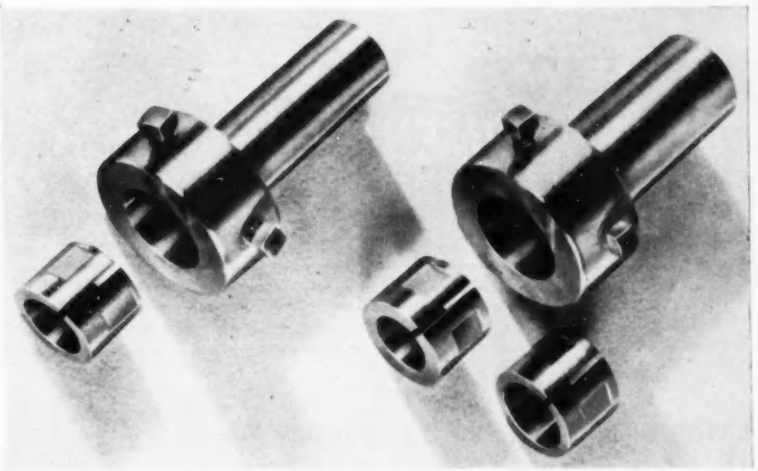
Screen Separator

Now available is a medium-size separator built to use a standard 24-in. diameter foundry riddle. It is operated by a ball bearing a-c motor through a nylon eccentric bushing.

The stroke of the screen movement is adjustable from zero to 1½ in. by loosening and tightening one bolt. Dimensions of the machine are 37 in. by 29 in. by 24 in. *Rampe Manufacturing Co.*

Circle 75 on page 73 for more data

Rampe screen separator.



Screw-Machine Tool Adapters

Introduction of a precision ground tool adapter for Brown & Sharpe automatic screw machines has been announced.

According to the maker, with only two adapters in place of the conventional six it is now possible to use #00 tools on #0 machines and either #00 or #0 on #2 machines. Thus the adapters are claimed to effect considerable savings in tool costs by affording broader use of smaller size automatic screw machine tools. The reduction to two sizes is accomplished by means of interchangeable self-locating bushings which are hardened and precision ground. Both the adapters and bushings are made of finest alloy steel, and all surfaces are hardened and ground for accuracy and long life. (American Cam Co.)

Circle 76 on page 73 for more data

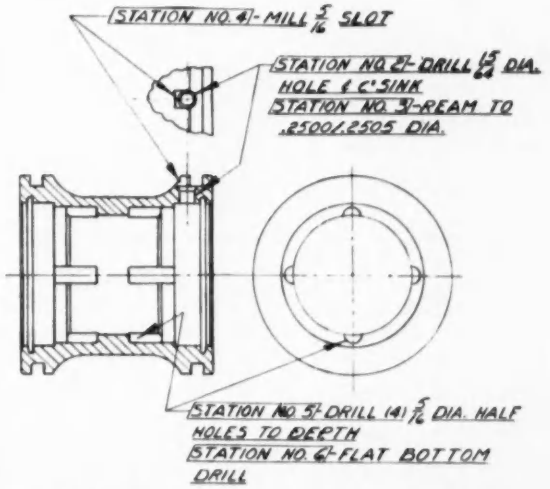
Automatic Machine for Steering Gear Parts

A special automatic six-station indexing-type machine is said to be able to drill, ream, mill and countersink steering gear pistons at the rate of 440 per hour at 100 per cent efficiency. The manufacturers of the machine state that specially designed fixtures and multiple spindle heads account for the high production rate.

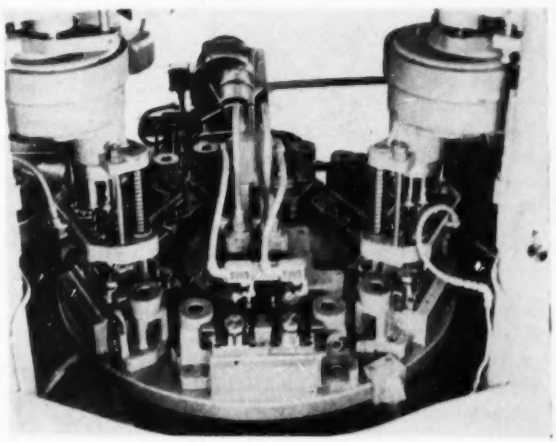
An unusual feature of the fixture and clamping mechanism is the dead-center indexing table mounting a stationary cam track. Rollers, attached to the fixture clamping mechanism, pass through as the table indexes from station to station. Limit switches, also attached to the center, make it impossible for the machine to operate unless the parts are clamped in place. The multiple spindle drill heads have guide pins which enter bushings in the fixture before the actual machining operation takes place, insuring high machining accuracy.

This machine has been designed and constructed with standard bases and columns. *Turner Brothers, Inc.*

Circle 77 on page 73 for more data


STATION NO. 4 - MILL 5/16 SLOT
STATION NO. 2 - DRILL 15/64 DIA. HOLE & C'SINK
STATION NO. 3 - REAM TO .2500/.2505 DIA.
STATION NO. 5 - DRILL (4) 5/16 DIA. HALF HOLES TO DEPTH
STATION NO. 6 - FLAT BOTTOM DRILL

Turner Brothers six station indexing type machine drills, reams, mills, and countersinks steering gear pistons. Operations are shown in the line drawing.



NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

(*Continued from page 69*)

Water-Oil Separator for Vacuum Pumps

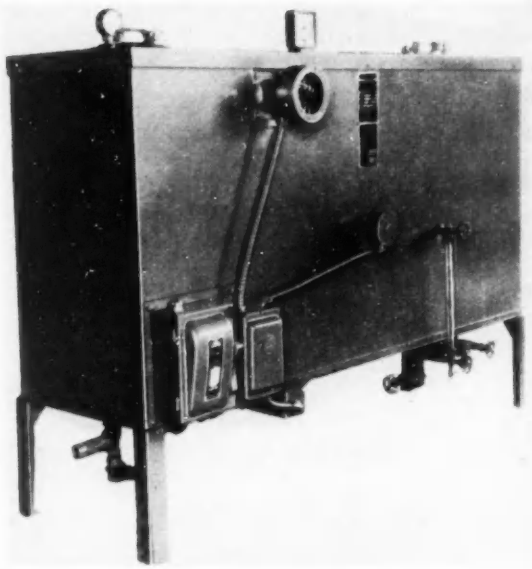
A redesigned Houdaille "Dri-Pure" water-oil separator is now being offered. This design is effective in the removal of moisture from vacuum pump oils.

Dri-Pure features two filtering compartments using "Palconia" (cellulose fibre) and "Cranite" (fullers earth) filtering media, plus a thermostatically controlled heating and settling tank. Passage of the oil through these sections effects the oil filtration and water separation.

Quick-opening lids over both filtering compartments offer access to handy, interchangeable filter cartridges, replaceable at intervals depending on the degree of oil contamination. Heater unit may be connected to any convenient electrical outlet.

Dri-Pure can be hooked up to service one or more vacuum pumps depending on the application. Unit is also available for turbines, hydraulic systems and similar operations where water creates an oil contamination problem. *Honan-Crane Corp.*

Circle 78 on page 73 for more data



Houdaille Dri-Pure water-oil separator.

Five Diameters Inspected Simultaneously by Gage

A multiple gage or "Multichek" that inspects simultaneously five bearing diameters on a drive shaft, and indicates by means of lights whether or not the dimensions are within tolerance, oversize or undersize, is a recently developed product. It is equipped with three "Airlectric" gage heads for checking dimensions to "tenths" and two "Electrichek" gage heads for "thousandths." Shafts can be inspected on this precision instrument at a rate of 600 to 800 per hour at 100 per cent efficiency. Minimum and maximum masters are used for the set-up.

When all dimensions are within tolerance, the master light at the base of the light panel remains white and the five signal lights black out. However, if one or more of the dimensions are out of tolerance, the master light turns red and individual red or green signal lights indicate respectively undersize or oversize. Where dimensions are correct the lights black out. *The Sheffield Corp.*

Circle 79 on page 73 for more data

Sheffield multiple inspection gage.

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Portable Air-Cooling Unit for Field Use

Recently developed is a portable air-cooling unit to give dependable service under variable field conditions. Reco Products Div. of Refrigeration Engineering Corp. designed a gasoline-driven unit which makes use of a special reheat coil to control air temperature within ± 2/F. Tenney Engineering, Inc., assisted in design of the special reheat and cooling coils.

The 26,500 Btu/hr unit is mounted on a two-wheeled trailer arranged for towing by another vehicle. Flexible ducts connect cooling equipment with space to be cooled.

The engine used is a four-cyl (three-in. bore, four-in. stroke), liquid-cooled, valve-in-head type which operates at 1200 to 1300 rpm.

The refrigeration-system compressor is a two-cyl (11/16 in. bore, 2/3 in. stroke), reciprocating type. *Tenney Engineering, Inc.*

Circle 32 on page 73 for more data

Free-Running, Self-Energizing Locknut

Recently announced is a seating-type, all-metal, free-running, self-energizing locknut that is said to be usable over and over. The grooved washer at the bottom of the nut is pressed over the threaded section suspended from the main body of the nut.

The unit is manufactured in various materials and reportedly will withstand temperatures up to 1600 F without thread seizure. Nut spins freely on the bolt down to the work. After the proper torque has been applied, the washer compresses, causing the threaded section inside the washer to move in and lock radially on the bolt.

When the threaded section inside the washer picks up all the load it can carry, it elongates a few thousandths of an inch to permit the bulk of the load to move up into the main body of the nut. *Klincher Locknut Corp.*

Circle 33 on page 73 for more data

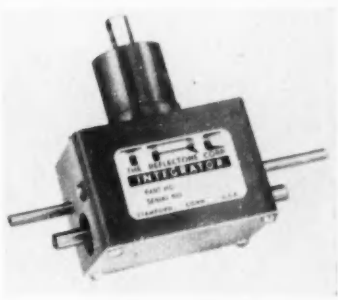
Ball-and-Disk Integrator for Reversible Speeds

Newly developed is a ball-&-disk type integrator which is said to be essentially a high-precision, comparatively low-torque, speed changer for generating variable reversible speeds in a smooth and stepless fashion using a minimum amount of space. It may be used for analog computers, servo mechanisms, and similar devices.

The unit is housed in a die-cast case of anodized aluminum alloy. It is claimed that hardened alloy precision steel disk and balls assure smooth operation with maximum accuracy and minimum wear.

Weight is reported to be only 17 oz. At 750 rpm input speed to the disk the maximum output speed is 1500 rpm. *The Reflectone Corp.*

Circle 34 on page 73 for more data

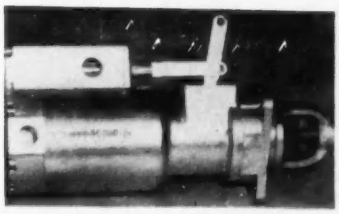


Hydraulic Cranking Motor for High Cranking Speeds

Recently developed is a hydraulic cranking motor for quick starting of heavy duty engines at all temperatures. Known as the Hydrotor, it comes in three sizes to fit and crank most internal combustion engines.

For installations requiring frequent starting, a small displacement engine driven pump and unloading valve are furnished with the unit to recharge the hydraulic accumulator automatically during engine operation. It is claimed that the complete system, in-

(*Turn to page 72, please*)



NEW PRODUCTS

For additional information, please use postage-free reply card on page 73

(*Continued from page* 71)

cluding the automatic recharging pump, will operate in the same manner as an electric or pneumatic system. *Hydramotive, Inc.*

Circle 35 on page 73 for more data

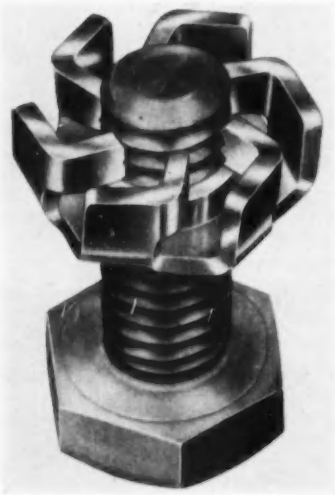
Secure Locknut

Recently developed is a "spin-down" locknut which is said to apply a permanent, vibration-proof grip only after nut actually contacts the work. It is claimed that this feature greatly increases assembly speed of automotive and industrial equipment.

Known as the Everlock nut, the unit is formed and threaded from a single piece of high carbon steel and is heat-treated after fabrication. At point of contact with the work, a one-quarter turn takes up all play. As nut is drawn tight, six threaded tines bite into the bolt in a shrinking action caused by the nut's concave base design. As nut is drawn tight, the base flattens to force the six buttress tines securely into the bolt thread.

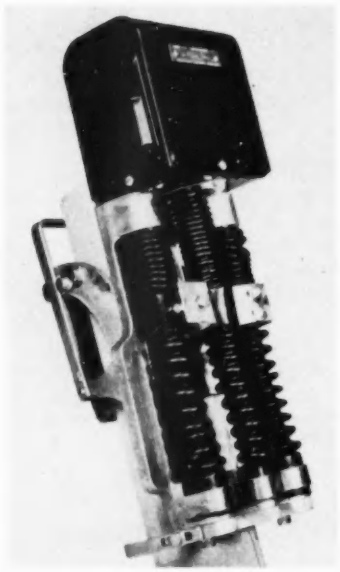
The locknut is said to be unaffected by water, oil, or heat up to 550 F. It is available in No. 8-10 and ¼-in. sizes in both National Fine and National Coarse threads. *Thompson-Bremer and Co.*

Circle 36 on page 73 for more data



Versatile Applicator for Buffing Compound

Now available is an air-operated buffing compound applicator that features a variable number of applications per minute. Designated as the "600" Series, the unit is available in four models to accommodate rectangular or round compound bars.



It is claimed that the applicator can be installed on all types of buffing machines from simple lathes to multi-operation automatics. Reportedly weighing less than 18 lb, the unit can be installed in any position without affecting operation.

Key feature of the applicator is its ability to feed any number of strokes per minute, applying compound only when required. The rate of feed is adjustable from .0015 to .015 in.

Major parts of the applicator are fabricated of cast aluminum to minimize overall weight. All operating parts are covered to seal out dirt, wheel lint, and compound. *George L. Nankervis Co.*

Circle 37 on page 73 for more data

Vee-Seal Packing

Said to be completely inert to hydraulic fluids, oils, petroleum products, acids, oils, bases, or solvents is a low-friction Series S-2500 vee-seal pressure responsive packing. Made of molded Du Pont Teflon, it is intended for valve stems and in hydraulic cylinders, jacks, lifts, and pumps.

The packing is reportedly self-sealing and self-adjusting at finger-tip gland pressures. Useful temperatures range from —110 F to 500 F. *W. S. Shamban & Co.*

Circle 38 on page 73 for more data

Metal Cleaner

Recently developed is a detergent known as Composition No. 26. It is said to be designed to remove extra-heavy soils from iron and steel in one operation, thus eliminating the need for separate precleaning and alkaline cleaning procedures.

Typical applications of the material reported include: removal of pigmented drawing compound; removal of solid-particle dirts and smuts; cleaning before vitreous enameling; and precleaning buffed metal before electroplating. *Oakite Products, Inc.*

Circle 39 on page 73 for more data

Truck Tire

Now on the market is a truck tire constructed with a "spread bead" principle designed to give more original and recap miles. The tire is currently available in sizes ranging from 7.00-17 eight-ply to 9.00-20 12-ply. *Hood Rubber Co.*

Circle 40 on page 73 for more data

(*Turn to page* 163, *please*)

Free INFORMATION SERVICE

Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRODUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.

USE THIS POSTCARD

FREE LITERATURE

Materials Handling

Now available is an eight-page illustrated booklet featuring 2000-lb capacity steel wire Cargotainers and pallets for shipping and storing all kinds of material and equipment. Typical examples of savings in materials handling costs by users are listed. *Pittsburgh Steel Products Co.*

Circle 1 on postcard for free copy

Screwdriving Tools

Catalog No. 21 is a 60-page booklet containing complete specifications, prices, and illustrations of production screwdriving tools. Requests for copies should be made on company letterheads to the manufacturer. *The Apex Machine & Tool Co., 1042 South Patterson Blvd., Dayton 2, Ohio.*

Production Facilities

Recently announced is a brochure describing the company's facilities for the manufacture of parts, components, or complete machines. *The Hartford Special Machinery Co.*

Circle 2 on postcard for free copy

Broaching Machines

Circular No. 502 describes a new line of heavy-duty horizontal hydraulic broaching machines equipped with electrical push button controls. *American Broach & Machine Co.*

Circle 3 on postcard for free copy

Versatile Pumps

Catalog No. 101 covers Model L Series small industrial pumps for lubricating, hydraulic, transfer, circulating, and burning oils service. Catalog No. 102 presents Model C Series general-purpose pumps for use with non-corrosive liquids with lubricating qualities. *Tuthill Pump Co.*

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Measuring Instruments

Recently published is a 34-page booklet entitled "Instruments for Modern Measurements" which describes over 37 different instruments. Requests should be made on company letterheads. *Brush Electronics Co., Sales Promotion Dept., 3405 Perkins Ave., Cleveland 14, Ohio.*

Milling Machines

Vol. 10, No. 1 of "Report" contains a feature article on the new No. 2-24 automatic milling machines. *The Cincinnati Milling Machine Co.*

Circle 5 on postcard for free copy

Air Handling Units

Bulletin 1600 describes a line of air handling units for industrial and commercial heating, ventilating, and air conditioning applications. *Sturtevant Div., Westinghouse Electric Corp.*

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(*Please turn page*)

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PAGE PRODUCTS

NAME ..... TITLE

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Tubular Conveyors

Bulletin HEM-120 shows engineering and mechanical details of a line of tubular conveyors. Also covered are conveyor drive mechanisms, roller turns, and a vibrator to assure positive discharge of conveyed materials. *Hapman Conveyors, Inc.*

Circle 7 on postcard for free copy

Arc Welding

Recently published is a reference table designed to help fabricators of tubular materials. It outlines pertinent details to be observed in joining similar and dissimilar alloys by arc welding. *Tubular Products Div., The Babcock & Wilcox Co.*

Circle 8 on postcard for free copy

Aluminum Foil Packaging

Fresh off the press is a revised and enlarged edition of a manual on aluminum foil packaging. It provides information on the variety of foil materials presently used and technical data on package design and application. Copies are available to packaging engineers and technical men who request it on company letterheads. *Reynolds Metals Co., 2500 South Third St., Louisville 1, Ky.*

Gears and Pumps

Vol. 14, No. 3 of "Engineering Forum" is devoted to a feature article on gear pumps and pump gears. *Eaton Manufacturing Co.*

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USE THIS POSTCARD

Silicone Products

Published on the firm's Tenth Anniversary is a booket relating the development of silicones and their diverse applications. *Dow Corning Corp.*

Circle 10 on postcard for free copy

High Vacuum Pumps

Catalog N. 750, now available, describes a line of Microvac pumps for high vacuum applications. *F. J. Stokes Machine Co.*

Circle 11 on postcard for free copy

Firm Activities

Fresh off the press is Vol. 1, No. 1 of a new quarterly publication entitled "Trends." It is intended to acquaint the company's friends and customers with what it is doing in its many fields of operation. *E. W. Bliss Co.*

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Disc Grinders

Bulletin No. 647-2RM describes a line of Hanchett-type double-spindle production disc grinders which can be furnished in various sizes. *Mattison Machine Works.*

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Structural Material

Recently announced is a booklet on Aircomb honeycomb structural material for aircraft and other applications where a high-strength, low-weight relationship is needed. *Douglas Aircraft Co., Inc.*

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Controlled-Volume Pumps

Bulletin No. 553 describes a line of motor - driven, controlled - volume pumps for numerous industrial applications. *Milton Roy Co.*

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Crane Scales

Bulletin No. 4105 covers typical applications of SR-4 crane scales and indicating or recording instruments for weighing loads electronically. *Baldwin-Lima-Hamilton Corp.*

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Fork Lift Trucks

Featured in the current issue of "Material Handling News" is an article on the X-70 "Fork Truck of the Future." The manufacturer's current lines of trucks are covered also. *Industrial Truck Div., Clark Equipment Co.*

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Measuring Equipment

Catalog GEC-1016A contains information on more than 115 testing and measuring devices for laboratory and production line use. *General Electric Co.*

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(*See preceding page*)

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PAGE ..... PRODUCTS .....

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COMPANY OR BUSINESS .....

ADDRESS ..... (No. & STREET) (CITY) (ZONE) (STATE)

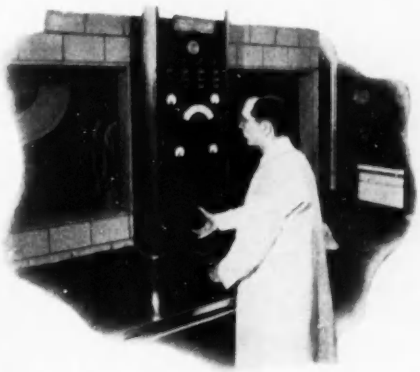
They're working on 195X models...

...and we're engineering the valves for them

Since the birth of the industry, Automotive Engineers have never ceased to search for new ways and new materials to make internal combustion engines constantly better.

Since 1901, Thompson Products, Inc. has accepted the responsibility for keeping valve designs and valve materials ahead of the progress being made by the automotive industry.

We intend to maintain that leadership.



VALVE DIVISION

Thompson Products, Inc.

DEPARTMENT VG-8 • CLEVELAND 17, OHIO

NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Silicone Rubber

Recently developed is a silicone rubber that is said to be a good cold resistant elastomer. Four access and escape hatches of the Douglas C-124 Globemaster are now being sealed against air leaks by a new kind of silicone rubber gasket.

Silicone rubber gaskets installed on Douglas C-124 Globemaster

It is claimed that SE-550 silicone compound enables rubber to be used at lower temperatures than ever before possible. The material shows little increase in modulus at —100 F and retains useful flexibility after 24-hour exposure at —120 F. High strength and unusual elongation are other features. SE-550 also has good compression set and electrical properties and remains inert at temperatures as high as 500 F, according to the manufacturer. *Chemical Div., General Electric Co.*

Circle 26 on page 73 for more data

Control Bearings

Recently developed is the DSRP series of high-capacity, self-aligning airframe control bearings. They feature a full complement of barrel-shaped rollers, one-piece inner and outer rings, and the efficient Plya-Seal.

Hardened back-up rings provide positive shoulder stops at extreme misalignment, yet allow for a full misalignment. *Fafnir Bearing Co.*

Circle 27 on page 73 for more data

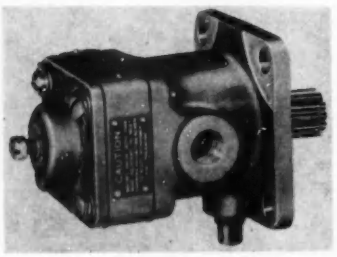
Control thermal switch.

Thermal Switch

Now in production is a two-wire thermal switch. Designated Type ASA-21-2, the switch is designed for high-temperature applications in jet engines, gas turbines, after-burner controls, or wherever temperature warning is required to 2000 F.

The unit is a non-grounded switch and reportedly will withstand any degree of overshoot or undershoot up to the ability of the metal to stand the temperature rise. It is said to offer maximum vibration resistance and is available in normally open or normally closed types. *Control Products, Inc.*

Circle 28 on page 73 for more data



Lear Model RD-7420-B fuel pump.

Fuel Pump

Now available is a fuel pump that is said to weigh only one lb complete with relief and by-pass valves. It has flanged mounting and splined shaft in two styles for 11- or 12-tooth standard engine pads, operates in either direction of rotation, and is designed for engines of 250-hp max.

Rated capacity of the Model RD-7420-B pump is two to 30 gph at 15 psi discharge and 3700 rpm. The excess flow, relieved through the balanced-type relief valve, recirculates internally in the pump. The valve is externally adjustable in range of eight to 20 psi.

The pump may be used with ordinary aviation gasoline or special aromatic blends. It operates satisfactorily at speeds to 4500 rpm, and has continuous flow at idling speed. Rotary vane, positive displacement element has high suction lift and is self-priming. *Romec Div., Lear, Inc.*

Circle 29 on page 73 for more data

Fuel Tank Repair Kit

Recently made available is a repair kit for re-sealing airplane integral fuel tanks. It is said to meet Spec. MIL-S-7502 and Air Force Tech. Order 01-1-3.

The kit consists of 175-grams of sealant in an eight-oz jar and a smaller jar of accelerator material, both packed in a single container, 11 kits to a carton. Each carton contains a multiple-duty plastic hand tool for mixing the accelerator and sealant, cleaning the old sealant from the repair area, and applying the new sealant. Also included is a jar of fuel barrier overcoat EC-776R. *Adhesives and Coatings Div., Minnesota Mining and Manufacturing Co.*

Circle 30 on page 73 for more data

Versatile Grease

Recently developed is a grease which is said to permit the efficient operation of aircraft accessories in ambient temperatures ranging from —100 F to 250 F.

Known as Low-Temp 1888, the grease is used to lubricate anti-friction bearings, gears, rolling and sliding equipment with low motivating power, some types of electronic equipment, instruments, small actuators, and some armament. *The Texas Co.*

Circle 31 on page 73 for more data

Need low starting friction and long bearing life?

here's how leading manufacturers of business machines get them with NEEDLE BEARINGS

Torrington Needle Bearings are essential design features of many business machines because of their low starting and running friction, their long trouble-free service.

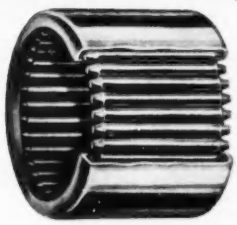
They have been *performance-proved* by years of day-in and day-out service on such machines as electric typewriters, addressing and duplicating machines, accounting machines, rotary card file systems, etc.

On the conveyor rolls, sprockets, gears, tape and feed roll shafts of duplicators, for example, Needle Bearings help reduce power requirements and keep motor size to a minimum. The Needle Bearing's turned-in outer lips effectively retain lubricants to keep these precision machines running for long periods without servicing.

The Torrington Needle Bearing has become "standard equipment" on countless products throughout industry since its introduction nearly twenty years ago. Its small size and infrequent lubrication needs are of great advantage in compact, tightly encased designs.

Perhaps the Needle Bearing can solve your anti-friction problems. Our engineers will be glad to work them out with you.

THE TORRINGTON COMPANY
Torrington, Conn., South Bend 21, Ind.



TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

Trade-marks of some of the business machine manufacturers whose products enjoy the benefits of Needle Bearings.

DITTO · IBM · UNDERWOOD · Remington Rand · PITNEY BOWES · Burroughs · Diebold · Addressograph-Multigraph · Cummins-Chicago Corp. · A·B·DICK DUPLICATING PRODUCTS · National

The BUSINESS PULSE

Expenditures for New Construction During First Half of Year Were About $16 Billion, a New High for January to June Period. Business Inventories Increased $4.5 Billion During Second Quarter of Year.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York

Effects of Korean Truce

Thus far the truce in Korea has had but limited impact in markets and on the general level of business activity, indicating that the settlement had been pretty well discounted during the extended period of negotiation which preceded the signing.

Apart from a moderate slackening of pace in some lines of activity because of summer vacations, business volume recently appears to have held at essentially the same high level as prevailed through the second quarter, and indications are that income and employment levels have also been generally steady.

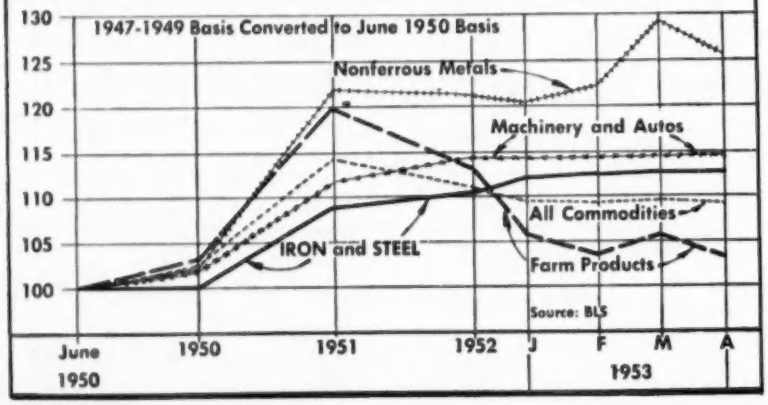
Vacations and furnace-repair work caused steel output to dip some five to six per cent below theoretical capacity during July, but with demand still very strong, it is believed that operating rates will return close to the 100 per cent mark before long. Consumers appear to have calmly accepted the higher prices that were announced after the wage settlement, just as they had previously accepted the increases in prices of "extras." Cancellations are still relatively unimportant, and order books for the fourth quarter, which were opened only recently, are reported to be filling up at a very satisfactory rate. Some decline in production is considered likely in the final quarter of the year, but nobody seems to feel that it will be very serious. Producer optimism is reflected in the recent strength shown by scrap prices.

Slowdown Foreseen in Car Production

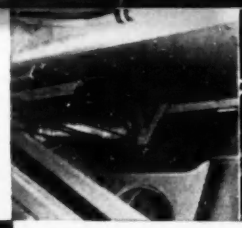
The same basic situation that has characterized the automobile industry for some months past continues. Production held at exceedingly high levels through July as the larger companies vied to strengthen their market positions, but dealers continued to complain of less than satisfactory sales experience. Particularly disturbing is the continuing sluggishness in used-car markets, where the hoped-for pick-up has not materialized. The general belief is that recent production levels cannot be maintained, and that a slowdown before long is practically inevitable. The question now is how much of a correction will be necessary to halt the rise in dealers' stocks. Spokesmen for the automobile companies have generally discounted the likelihood of serious cutbacks and have indicated the belief that substantial layoffs of production workers can be avoided in view of the fact that overtime operations

(*Turn to page* 147, *please*)

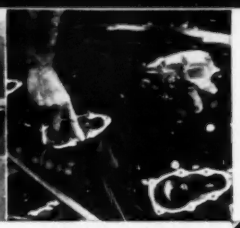
Indexes of Wholesale Prices, Since Start of Korean War

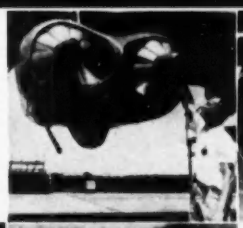


Source: American Iron and Steel Institute.



Each of the 12 vents on the B-36 are wrapped with resistance wire and Silastic R Tape to keep ice from plugging oil vent lines.

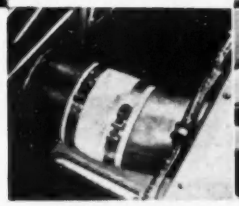


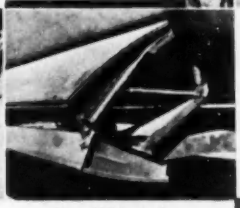


Thin layers of Silastic insulate bare resistance wire inside jet intake door panels; conduct deicing heat evenly and rapidly to panel surfaces.

More than 180 limit switches on the B-36 are protected with Silastic boots to assure reliable operation at temperatures ranging from —100° to 170°F.

Silastic-coated glass cloth gaskets on the rockerboxes of the P & W engines give long service in contact with oil at temperatures up to 450°F.

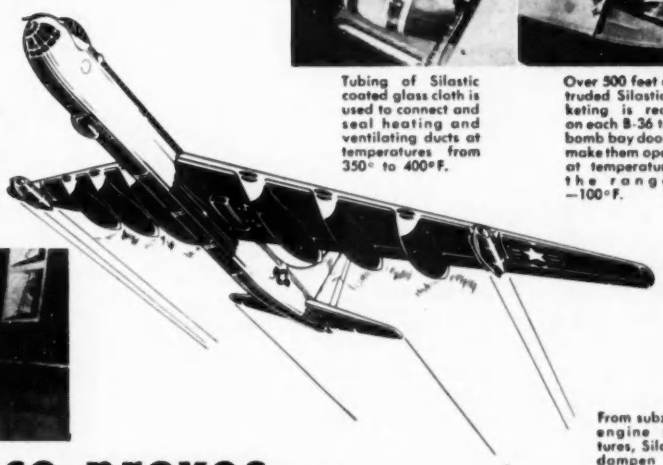




Nose turrets are sealed with two 56-inch lengths of cloth-wrapped, sponged Silastic tubing.

Over 300 Silastic flange gaskets in each B-36 seal hot air system at temperatures as high as 400°F.

"Orlon" wrapped, sponged Silastic seals prevent air turbulence between flap and engine nacelle; last 10 times as long as materials previously used.

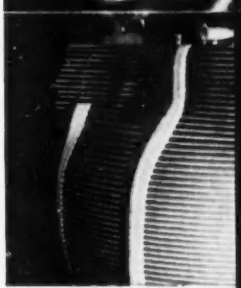


Tubing of Silastic coated glass cloth is used to connect and seal heating and ventilating ducts at temperatures from 350° to 400°F.

Over 500 feet of extruded Silastic gasketing is required on each B-36 to seal bomb bay doors and make them operable at temperatures in the range of —100°F.

Ninety feet of cloth-wrapped, sponged Silastic is used to prevent turbulence and short circuiting of air between leading edge of the flaps and trailing edges of the wings.

From subzero to hot engine temperatures, Silastic strips dampen vibration and prevent breakage of cooling fins on aircraft engine cylinders.



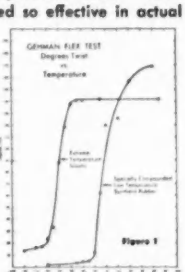
Performance proves...

SILASTIC* works

where other materials fail!

Extreme temperature Silastic stocks are the only rubbery materials that retain their resilience after long exposure to temperatures from —100° to 350°F or after repeated short term exposure to temperatures from —130° to over 500°F. That's why Silastic parts have proved so effective in actual service on the high flying Convair B-36.

The usefulness of rubberlike materials at extremely low temperatures can be established by the recently developed Gehman Flex Test Method (ASTM D1053-52T). Values measured according to this method on an extreme temperature Silastic and a synthetic organic rubber especially compounded for a low temperature service are plotted in Figure 1.



You will note that Silastic does not begin to stiffen until it reaches —50°F, and that it still has a twist value of 13.5 degrees at —130°F. The special low temperature organic rubber loses resilience at +50°F, and will take a twist of only 12 degrees at —22°F.

The usefulness of Silastic on the B-36 is increased by its excellent resistance to oxidation, weathering and to a variety of hot oils. In electrical applications, Silastic stocks are unique even among silicone rubbers for low water absorption and excellent dielectric properties, plus high physical strength.

That kind of performance is typical of Silastic, the Dow Corning silicone rubber. When you need flexibility or good dielectric properties in a resilient material that will withstand years of weathering or long exposure to temperatures far above and below the limits of ordinary rubbers, specify Silastic.

*T. M. REG. U. S. PAT. OFF.

ATLANTA
CHICAGO
CLEVELAND
DALLAS
DETROIT
LOS ANGELES
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(Silver Spring, Md.)

first in silicones

DOW CORNING CORPORATION
Midland, Michigan

These and other B-36 applications for Silastic are more fully described in the March 30, 1953 issue of Aviation Week.

In Canada: Fiberglas Canada Ltd., Toronto In Great Britain: Midland Silicones Ltd., London

MAIL COUPON TODAY FOR DATA ON THE PROPERTIES OF SILASTIC.

DOW CORNING CORPORATION, Dept. C-8, Midland, Michigan

Please send me:

- ☐ Silastic Facts 10a, properties and applications of Silastic stocks and pastes.
- ☐ List of Silastic Fabricators.
- ☐ "What's A Silicone?", your new 32-page booklet on silicone products and applications.

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AIR BRIEFS

By ROBERT McLARREN

No Truce Effects

Cessation of fighting in Korea will have virtually no effect on aircraft production, according to Washington sources. The new fiscal 1954 budget provides $3,495,000,000 for USAF aircraft procurement and $1,379,000,000 for Navy plane purchases. The Air Force is scheduled to receive 8800 airplanes during this year and the industry is currently producing well over 1000 airplanes a month. Navy will receive about 2500 airplanes this year. Only immediate change in military aviation expenditures will be sharp reductions in jet fuel, jettisonable fuel tanks, ammunition and other combat equipment. The Air Force reveals that the war in Korea was costing better than half-a-billion dollars a year but this expenditure will continue without significant reduction since the existing forces in the Far East will continue on duty. Stopping aircraft losses in combat will have no effect, since production rates will continue unabated in the U. S.

Employment Drops

Although production rates continue unchanged, total aircraft manufacturing industry employment has dropped for the first time since the start of the war in Korea. During April, the latest month for which Bureau of Labor Statistics have been reported, airframe industry employment dropped 2200 and engine industry personnel dropped 7600. Propeller and other segments of the industry maintained an even employment keel. Total employment during April was 728,900—a decline of 8000 from the 736,900 employed in March. However, engineering and clerical employment increased 1500 during the month, indicating the net loss was in production workers. Observers interpret the drop as a combination of revised production schedules and the inevitable consequence of the "learning curve" in reduced manhour required per airframe pound delivered. Indications are that the drop will continue during the summer, particularly when the loss of the Kaiser personnel is reflected, but will hold steady through the winter.

Turboprop Transport

It now appears certain that the jet transport battle has all but consumed itself, but from its embers is rapidly rising a turboprop era in U. S. transport history. Proponents of the aircraft gas turbine driving a propeller reached the zenith of their argument a few weeks ago when C. R. Smith, American Airlines president, came out flatly in favor of the turboprop transport as the next form his airline will consider. This sounded the death knell of any immediate prospects for jet transport airline sales and sent Douglas, Lockheed and Boeing scurrying to their drawing boards. Douglas is now distributing a prospectus for its DC-9, a turboprop version of the DC-7. Lockheed has design for the Super Constellation powered by a variety of turboprop engines and Boeing has prepared preliminary studies of the big Stratocruiser using four Pratt & Whitney T34 turboprop engines. The services are leading the trend by supporting initial turboprop installations in current transport types. Already on order are the Navy Lockheed R7V-2 powered by four P&W T34 units of 5500 hp each, the Air Force Lockheed C-130, a high-wing cargo airplane using four Allison T56 turboprops, the Air Force Douglas YC-124B, a version of the giant Globemaster powered by four P&W T34 units and the Air Force Convair Liner using two Allison T38 units. Air Force is also planning to obtain the turboprop Stratocruiser version. All of these plans seem thoroughly realistic and obtainable in the near future as compared to the grandiose jet transport arguments of the past two years. Virtually all existing piston-engine transports can be adapted to turboprop power for future production, and even some now in service (Super Constellation, Convair 340 and Martin 4-0-4) can be converted in service, although cost studies indicate such a move is economically unsound.

Industry Safety

The concerted drive for plant safety in the aircraft manufacturing industry during the postwar years has resulted in a 23 per cent reduction in disabling injuries over the past year to a new low figure of 4.21 such injuries per million manhours worked. Lost time accidents have been reduced 46 per cent to only one-third day per one thousand working hours. The National Safety Council has recognized this performance as outstanding among the industries of the nation.

(*Turn to page* 156, *please*)

Chrome-Faced Cyclan Ring

high-strength

heat-treated

resilient

long-wearing

Cyclan

offers a combination of advantages not found in any other piston ring material

Sealed Power's new alloy for extreme operating conditions

Developed by Sealed Power metallurgists after years of experimenting and testing, Cyclan has strength approaching steel, resilience and life-expectancy exceeding cast iron, yet it retains the desirable bearing characteristics of cast iron. Cyclan has exceptional ability to retain these unique physical properties under extreme operating heat.

Cyclan piston rings will not break in super-charged engines. Their gaps will not change. They have extraordinarily high impact value for shock resistance. Resilience persists even after considerable distortion.

Available now

Cyclan can be readily chrome plated, but it functions very efficiently without any plating.

Cyclan is available for original equipment piston rings in heavy duty engines. Some Sealed Power Cyclan Ring Sets are available for replacement now. Others will follow soon.

Let our engineers tell you the Cyclan story!

Sealed Power Piston Rings

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Sole manufacturers of KromeX Ring Sets, MD-50 Steel Oil Ring, Full-Flow Spring, Flex-S Flexible Oil Ring, and GI-60 Groove Inserts.
Leading Producer of Automatic Transmission Rings, Power Steering Rings and Non-Spin Oil Rings.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 23

Canadian Car Output Shows Sizable Gain

Canada produced 41 per cent more passenger cars in the first six months of this year as compared with 1952, according to reports. Some 206,903 cars rolled off the assembly lines in the first half of 1953.

Piasecki Establishes Canadian Subsidiary

Formation of Piasecki Helicopter Co. of Canada, Ltd., a wholly-owned subsidiary of Piasecki Helicopter Corp., has been announced by the parent corporation.

Italian Steel Firm to Open in Canada

A new industry will be operating in the Niagara Falls, Ont., area by the beginning of next year. The new firm, Fran Steel Products, with headquarters in Turin, Italy, will manufacture springs for cars and other automobile accessories in a plant with 10,000 ft of floor space.

Ontario Steel Erects Two New Parts Plants

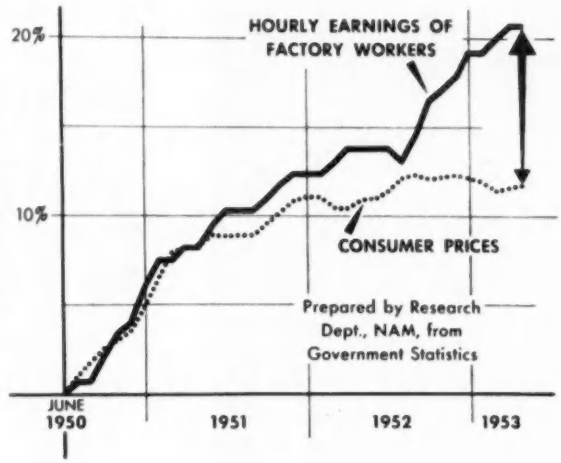
Ontario Steel Products Co., Ltd., reports it has purchased 70 acres of land at Milton, Ont., and has started to erect two new plants to manufacture and process automotive parts. It is anticipated that the new plants will be in full operation early in 1954.

Mexico Buys Quantity of Farm Machinery

In the first four months of this year, Mexico bought about $1,511,900 worth of modern agricultural machinery. Number of units entering the country totaled 10,326, including plows, threshers, sheavers, sowers and shelling machines. Major part of the equipment was purchased from the U. S. with minor purchases in Canada, England and Germany.

WAGES VS. PRICES

Factory workers have fared well in the price and wage changes which have occurred since June 1950. This National Association of Manufacturers chart indicates that since June 1950 hourly pay increased 20.7 per cent while consumer prices increased only 11.7 per cent.



French Ford Loss Being Made Up

Ford Motor Co. of France has increased five months' sales by 1960 units over last year to 11,323. Sales to the end of May were $24.7 million, compared to $24.7 million for the same period last year. The increase was maintained in June. Operations last year showed a loss of $1.18 million. Since then the general management of the firm has changed hands.

Austin Vehicles to Korea

Austin Motor Co. is supplying a large number of commercial vehicles to be used in the rehabilitation of South Korea.

Orders so far placed with Austin total nearly 600 vehicles, and delivery is now under way.

Norma-Hoffman Sold

Controlling interest in the Norma-Hoffman Bearings Corp. has been purchesed by the Universal American Corp. of New York from Hoffman Manufacturing Co., Ltd., of Chelmsford, England. The transfer of the ownership of the bearings company ended 30 years of British control.

1953 MOTOR VEHICLE FACTORY SALES*

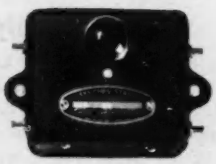
	Passenger Cars	Trucks	Buses	Totals 1953	Totals 1952
January	453,319	111,599	254	565,172	375,410
February	498,071	96,740	190	563,001	435,216
March	566,320	134,129	236	700,685	482,972
April	596,633	126,754	145	723,532	529,585
May	549,677	93,443	387	643,487	503,917
June	587,549	74,063	380	661,992	518,710
Total—Six Months	3,239,569	638,728	1,572	3,877,869	2,845,811

1953 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	53,077	21,481	4,087	16,333	3,950	8,766	3,905	111,599
February	45,121	18,279	3,413	13,305	4,287	8,255	4,080	96,740
March	59,951	25,153	6,159	22,962	5,618	9,503	4,783	134,129
April	55,652	25,680	5,770	21,005	5,187	8,856	4,604	126,754
May	43,612	16,293	3,580	13,379	4,823	7,900	3,656	93,443
June	33,297	11,628	2,169	10,102	4,549	8,217	4,101	74,063
Total 6 Mos. 1953	290,910	118,514	25,178	97,086	28,414	51,497	25,129	636,728
Total 6 Mos. 1952	283,882	124,400	34,743	131,230	30,381	57,443	25,665	642,744

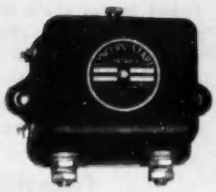
* Automobile Manufacturers Association.

RELAYS AND SWITCHES



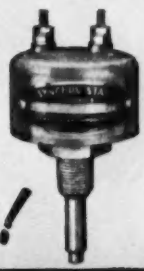
The K R A Series of Relays contain a one inch Bulls Eye indicating light and a terminal for connecting to an alarm bell or horn to give a signal when either a battery circuit is closed or where it is grounded. Time delays can be included for either making or breaking a circuit or both. Commonly used to give a warning in case of low oil pressure or high water temperature on engines.

The Model "G" Series of Switches are operated by a centrifugal governor that will open or close circuits at any desired R.P.M. They have an adjustment range of approximately 20% increase or decrease of the R.P.M. requested and can be manual or automatic reset type. The centrifugal operating unit can be direct connected or driven by gear-belt or chain, when used with our angle drive adapter.



The Model "C" Series is a heavy duty contactor for closing starting motor circuits or any other circuits from some remote control switch, either manual or automatic. This contactor is the same used in conjunction with our Automatic Controls for closing of the starting motor circuit. Contact capacity at 6 Volts D.C. inductive load — 1200 amp. inrush — 450 amp. cranking.

Pressure—Temperature and **Vacuum Switches.** These are used for Pilot Switches to open or close a circuit at predetermined values and are adjustable within certain ranges. They are sealed and of very rugged construction. Snap action-switches are used which are operated by a sylphon bellows.



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SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

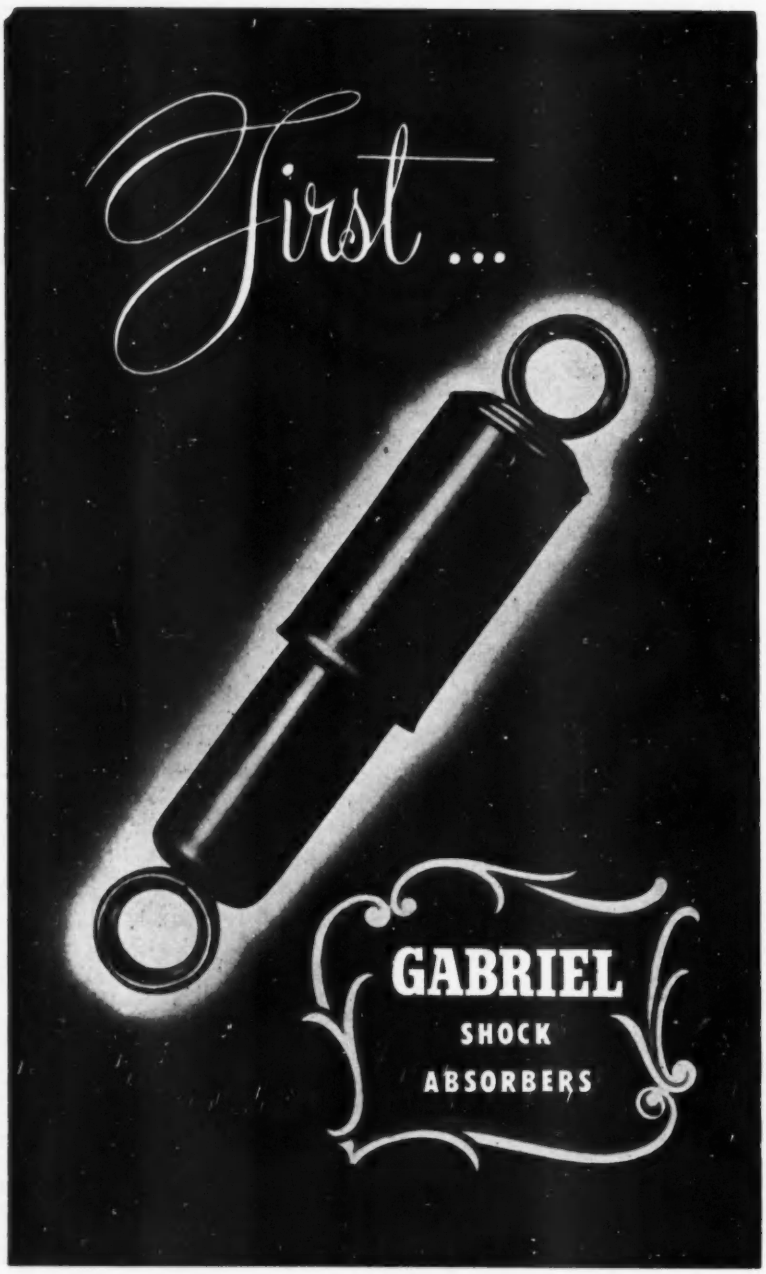
8151 NORTH RIDGEWAY AVENUE, SKOKIE, ILLINOIS

SAE Brake Fluids

(*Continued from page* 51)

Water Tolerance

Water tolerance is one of the inherent characteristics of non-mineral oil type brake fluids that is considered important to safe brake operation. Experiences have shown that it is not uncommon to find up to 3½ per cent of water in brake systems after having operated in all kinds of weather and road conditions. If the water entering the brake system is not absorbed and dispersed, then it might localize at one of the small passages and freeze into ice, stopping brake action. Further, the presence of moisture should not upset the fluid balance, causing stratification or precipitation of inhibitors, etc., at the operating temperature ranges.



Neutrality

The neutrality or pH requirements of the S.A.E. Specifications were established by studying various types of fluids that were found compatible with the various metal parts of the brake systems. With few exceptions fluids with pH values beyond the range specified will be found to be too corrosive.

Stability

Stability, next on the list, has to do with the maintenance of the boiling point within five deg of the minimum specified, while being held at high temperatures and in contact with brake parts for six hours.

Since the safe operation of hydraulic brakes depends upon brake fluids to have and maintain sufficient boiling points to remain in liquid state at all times, then stability can be considered an important requirement.

Rubber Swelling

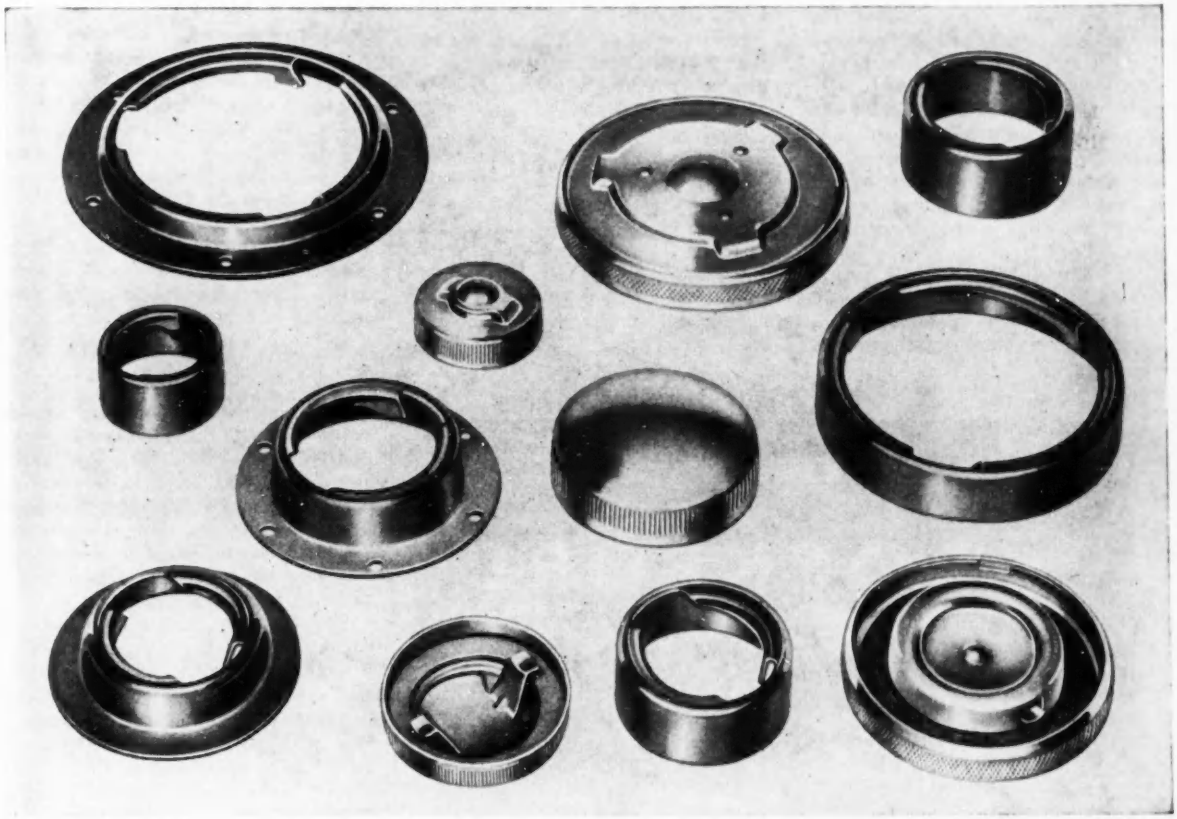
Before establishing rubber swelling requirements for the S.A.E. Brake Fluid Specifications, the members of the committees ran hundreds of tests on various fluids and various makes of rubber cups. The limits set were found to correlate with actual brake service records. The committee is now working on a revision of this section of the specification due to the use of synthetic rubber parts and to higher brake temperatures.

Compatibility

It is a well established fact that brake engineers do tailormake their hydraulic brake systems to function best with one particular fluid, and that using another fluid or mixing another fluid with the original may not give the same over-all performance; but, it is the intention of the S.A.E. engineers that fluids meeting the S.A.E. Specifications will, when mixed with the original equipment fluids, give satisfactory performances.

Lubrication

The S.A.E. engineers found that there were no standard test machines which would give practical lubrication values for brake fluids. The best test method was found to be to set up the actual brake system and operate it using the test fluid in a manner similar to regular brake service. The test limits for the stroking test were not tied down by exacting measurements, etc., instead visual examina-



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tions of the operation and parts after test were required for evaluation. The temperature, pressures, and number of strokes for the test were set only after hundreds of stroking tests were made by the S.A.E. Brake Fluid and Brake Cup Committees. Some S.A.E. fluids have been found to have marginal lubricating qualities when used in some of the new power brakes, power steering, and window lift units. Such units may have to be taken into consideration in future brake fluid specification work.

If a pump is to be operated at high pressure, then better lubrication is needed than is required by present brake systems. As an ideal lubrication value a pump test is specified and the ideal brake fluid is required to give test results equivalent to No. 10 S.A.E. oil.

Residue

A storage or residue test was included in the S.A.E. Specifications to ascertain that brake systems would not become corroded or gummed, or contain a residue when stored for a long period of time due to improper brake fluid.

Evaporation

Experiences with various brake fluids over the years have shown that at least 15 per cent of oily base is needed to properly lubricate the brake parts. The slight fluid seepage past the wheel cylinder cups comes in contact with air and evaporation takes place. If no oily base is retained on the piston after evaporation, increased wear results. The boiling point limits control the rate of evaporation so no further requirements are included in this section.

Corrosion

Better methods of test and lower corrosion limits than those now specified are under consideration, as there is evidence that some fluids meeting the tests are too corrosive in brake systems. Five per cent of water is added to the test fluid to assimilate the worst moisture conditions encountered in brake systems.

The sealed test jar was found necessary to get comparable results; but, in actual service the fluid is in contact with the atmosphere, which may be the reason for the lack of correlation with actual service. Another factor to be considered in future revisions is the use of synthetic rubber cups in the corrosion tests. The better fluids of today, when tested in accordance with the specifications, usually give results less than one-third of the maximum values specified.

Other Requirements

It will be noted that several other minor requirements have been added to the specification for the ideal brake fluid. Complaints have been registered against brake fluid due to the annoying penetrating odor, by factory workers, mechanics, and drivers of cars in which brake fluid was spilled or leaked.

The finish on cars has been ruined by careless handling of brake fluid or leaks; so, an ideal fluid should not attack enamel, lacquer, etc.

Foaming has not been a problem with brake fluids in the past, but may be an important factor in the power systems.

No color identification has been specified for fluids meeting the S.A.E. Brake Fluid Specifications, but some feel that a distinctive color may be helpful for identifying purposes.

Use of Specifications

When the S.A.E. Brake Fluid Specifications were issued in 1947 it was the hope of the car manufacturers,

CLUTCHES by ROCKFORD

This "Sure Footed" Crawler Isn't Afraid of Deep Mud

The wide gauge and high ground clearance of the American Terratrac help it "keep its feet" on steep slopes — and keep the engine out of mud and water, up to 27" deep. ROCKFORD CLUTCHES help it perform the toughest dozer jobs in slippery going. Let ROCKFORD clutch engineers help solve the difficult power transmission control problems of *your* heavy-duty machines.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.

Facts you should know about Kearney & Trecker's Special Machinery Division

If you're a potential buyer of special machines or special tooling – read about our expanded facilities

THOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to $3,000,000 annually.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

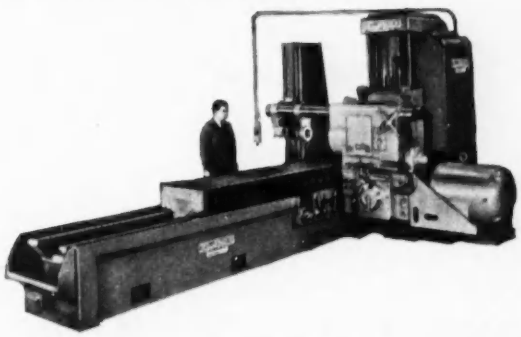
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

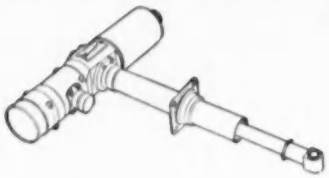
We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.

Airborne Actuator for the Sturdy Savage



Tiny but essential—that's the LINEATOR® Electric Linear Actuator. Huge but handy—that's North American's new XA2J-1 Savage. Combined, they do a job for the Navy.

The R-144 M16 Lineator is used as the actuator in a temperature control system furnished by Airborne. Other models and similar Airborne electromechanical units are standard equipment in many Service and civilian aircraft. You'll find data on Lineators and other Airborne actuators, motors and ANGLgears in the Engineering Catalog of the Institute of the Aeronautical Sciences. We invite inquiries.

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue
Hillside 5, New Jersey

the brake manufacturers, the auto safety councils, the insurance companies, the highway safety engineers, the Society of Automotive Engineers, and others having the knowledge of the importance that brake fluid plays in the safe operation of brakes, that all of the brake fluid manufacturers would immediately use the specifications, and for the sake of the safety of the motoring public, not make fluids below the S.A.E. standards. However, the S.A.E. Specifications have not been used as expected. We still find dozens of brands of so called brake fluids on the market made by using cheap alcohols (ethyl, methyl, iso-propyl) with boiling points of less than 180 F. Considering that many car manufacturers are now using only heavy duty brake fluids, the presence of the low grade brake fluids in our brake service stations is certainly an alarming situation.

Conclusions

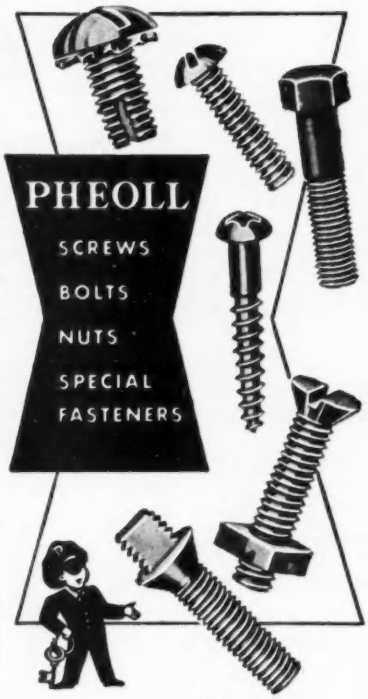
The best answer to the problem as the writer sees it is for all brake fluid manufacturers, dealers, distributors, importers, etc., to realize that even though the courts have not been active in placing the blame on them for brake failures due to their sub-standard fluids, that the moral obligation is still theirs, and they should immediately stop making, selling, or importing fluids below the S.A.E. standards. If voluntary steps are not soon taken by the brake fluid manufacturers, legislation will be forthcoming. We cannot reasonably expect a car or truck owner to be fully familiar with brake fluid selection—the manufacturers, dealers, garagemen, etc., must be responsible.

The above is an abstract of a paper presented at the Annual Meeting of the Chemical Specialty Manufacturers Association by the author who is Chairman, Brake Fluid Committee of the S.A.E.

New Military Types Seen at Detroit Show

A Navy guided missile, Air Force anti-radar equipment and even a flying saucer (rubber gasoline containers for aerial resupply) were shown publicly for the first time at the sixth International Aviation Exposition at Detroit last month.

The four-day show, in which racing is no longer a part, featured static displays of commercial and military exhibitors. Included were the Navy's Regulus missile, developed by Chance Vought Aircraft, service aircraft and carrier equipment.



Will Keep Your Assembly Lines at Peak Capacity

Whatever you manufacture or assemble, you can speed production and improve your product by using Pheoll screws, bolts and nuts. These industrial fasteners drive easy and straight, and will not bind because threads are accurately rolled or machined. Precision-made screw and bolt heads, slots and head recesses prevent wrench and driver slippage. Count, too, the added bonus you receive by using fasteners that improve product appearance.

An interesting story on standard and special industrial fasteners and their profitable applications to your needs may be obtained from experienced Pheoll engineers. Ask these men to recommend screws, bolts and nuts that will increase your overall profits on assembly line work.

these Pheoll products prevent production lag

Tapping Screws • Cap Screws • Sems • Phillips Recessed Head Screws and Bolts • Machine Screws • Special Fasteners • Thread Cutting Screws

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NUTS

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Carburetor Value as though you were Buying rather than Building the Car!

Put yourself in your customer's shoes. *Lasting performance* is vital to him—and it's certain to effect the selection of his *next* car. It is only logical then, to specify components that will insure that characteristic in the engines you build. In carburetors, Stromberg is unique in this respect, for it is a proven fact that Stromberg* Carburetors *last longer*. Take the *long-range* view of carburetor value and you will agree, it's good business to specify Stromberg Carburetors.

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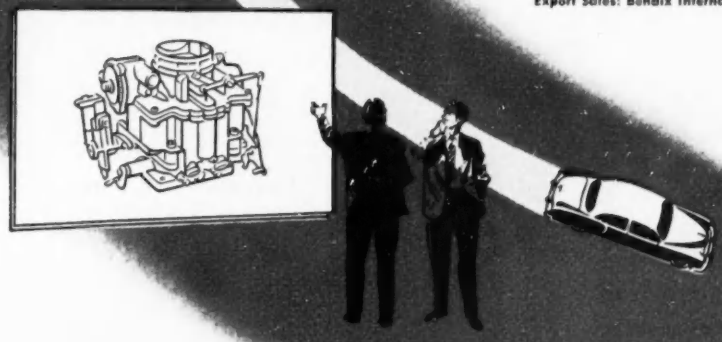

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- Standard Equipment Sales: Elmira, N. Y.
- Service Sales: South Bend, Ind.

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

MEN *in the* NEWS

(*Continued from page* 25)

U. S. Rubber Co.—**Warren A Tipton** has been appointed general sales manager of the mechanical goods division, succeeding **Walter F. Spoerl**, who is retiring after 45 years service.

Prewitt Aircraft Co.—**Norman J. Burke** has been appointed vice-president.

Bendix-Westinghouse Automotive Air Brake Co.—**William L. Collins** is branch manager of the new Oklahoma City plant, while **Charles H. Young, Jr.**, and **Calvin F. Zoltner** are branch engineer and office manager, respectively.

B. F. Goodrich Co., Tire & Equipment Div.—**Chester T. Morledge** has been named general manager, merchandising. He succeeds **J. A. Hoban**, who has become a vice president.

Leeds & Northrup Co.—**I. Melville Stein** has been elected president, succeeding **Charles S. Redding**, who has become chairman of the board. **D. H. Schultz** takes Mr. Stein's place as executive vice-president. **George W. Tall, Jr.**, vice-president, assumes the additional post of secretary.

Wilkening Manufacturing Co.—**Irvin Buntin, Sidney Harris**, and **Frank Parker, Jr.**, are now sales managers of the Upper Midwest, Middle Atlantic, and New England Divisions, respectively.

U. S. Rubber Co., Mechanical Goods Div.—**James C. Westfall** was named assistant to the vice-president and general manager.

Gemmer Manufacturing Co.—**Frank E. Phillips**, senior vice-president, is retiring Sept. 1.

Jack & Heintz, Inc.—**Shelby A. McMillion** has joined the firm as director of advertising and public relations.

Parker Aircraft Co.—**F. E. Amon** is now vice president in charge of sales; **R. J. Trivision**, vice president in charge of manufacturing; and **Warner B. McCarthy**, secretary-treasurer.

United Specialties Co.—**R. J. Schaffer** has been named general sales manager of Chicago, Philadelphia, and Birmingham. **M. T. Moler** is now sales manager of Chicago.

Kent-Moore Organization, Inc. — **John T. Davis** has been appointed advertising manager.

Norton Co.—**David B. Tyler** has been named to handle advertising of precision grinding and lapping machines, refractory and boron carbide products. **Clifford S. Duxbury, Jr.**, will direct export advertising.

Northrop Aircraft, Inc.—**Edward M. Owen** has been appointed assistant director of military relations, and **Max R. Stanley** has been named director of the flight department.

Aerojet—General Corp. — **Dan A. Kimball**, former secretary of the Navy, has been elected president.

Bone Engineering Corp.—**Edward G. MacLennan** has been appointed sales manager.

(*Turn to page* 93, *please*)

Eclipse-Pioneer* triples balancing output of air-pump rotors with TREBEL BALANCER

Rough balancing increased from 3.1 to 9.6 per hour
Fine balancing increased from 3.15 to 13.1 per hour

*Division of Bendix Aviation Corporation

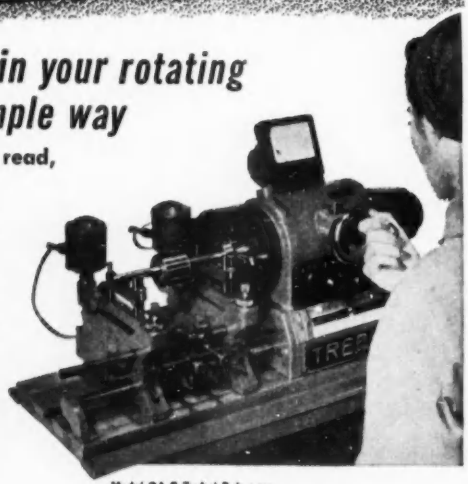
Locate unbalance in your rotating parts this fast, simple way

Takes less than a minute to read, 2 minutes to set up.

No special skills are needed to detect the *unbalance* that causes *vibration* in rotating parts . . . when you use the TREBEL DYNAMIC BALANCER.

The unique TREBEL dynamic balancing principle applies a variable counter-vibration to counteract unbalance vibration. Direct readings in ounce-inches give the *amount* of unbalance without further calibration; readings in degrees show *location* of unbalance.

That's why so many leading plants use the TREBEL.



Model 2 b S Trebel Balancer
Weight capacity 2½ oz. to 4½ lbs.
Max. work diameter 7"; length 18"
Accurate within .000025" displacement of center of gravity
Other Trebel models for work up to 22,000 lbs. and 98½" OD.

Write for Catalog "B" or see a demonstration in your own plant.

KURT ORBAN COMPANY, INC.

205 East 42nd St., N. Y. 17 • Offices in Cleveland, Detroit, Los Angeles, San Francisco, Houston
Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada.

Here's *usable beauty* for exacting service . . . wear-resistant, hard, bright and strong throughout! SUPERIOR STAINLESS forms smoothly and easily because it is uniform in every physical quality: facts proved by the mile in mouldings manufacture every day. • May we serve *your* stainless steel strip applications?

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

For the long haul... Autocar relies on RB&W bolts

Famous truck builder rates them best for ease of assembly and accessibility

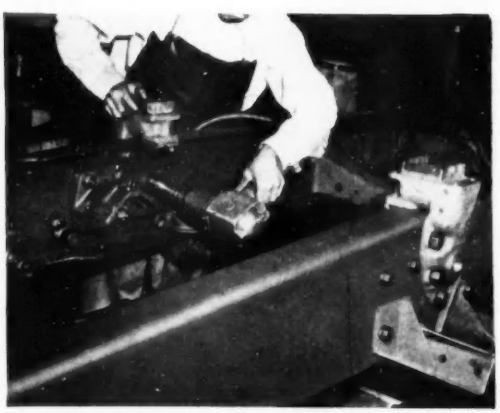
It's been a long time since the Autocar people switched from riveted to bolt-and-nut construction. Here's how it happened:

Two Autocar engineers took off on a coast-to-coast run to shake the bugs out of a new test model. Things went well until a riveted spring bracket broke. It took an entire day just to chisel through the rivets because it was hard to get at the bracket.

From that day on, it was *accessible* bolt-and-nut construction exclusively for all Autocar trucks. And Autocar standardized on RB&W bolts. One dividend from using these rugged bolts is that Autocar can specify higher-strength material than is practical for riveting. Furthermore, tests on structures like bridges show that rivets frequently loosen. This doesn't happen to bolts on Autocar frames.

Where you want to join structural members firmly together so they'll *stay* together for good, high-strength bolting is often your best bet.

As the leading manufacturer of all kinds of fasteners, we're in the unusual position of always being able to recommend and supply the right ones for all your needs. Write to RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



FASTER FASTENING is achieved in the Autocar plant at Ardmore, Pa., by using air tools like the one shown here to run up RB&W nuts on RB&W bolts on an Autocar truck frame. In addition to making tight, accessible joints, bolting effects substantial assembly savings. 3.1

RB&W

108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, PITTSBURGH, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO. *Sales agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*

MEN *in the* NEWS

(*Continued from page* 90)

Douglas Aircraft Co., Inc.—Newly elected directors of the company are **Donald W. Douglas, Jr., Nat Paschall,** and **Stanley G. Welsh. William E. Douglas** resigned from the board.

AiResearch Manufacturing Co. — **Burnham Adams** has resigned as sales manager.

Henry J. Kaiser Co.—**L. H. Oppenheim** has been named a vice-president and will continue his activities as assistant general manager of Kaiser Engineers, a division of the parent firm.

General Petroleum Corp.—**Thomas P. Simpson** has been named assistant director of manufacturing.

Inet, Inc.—**Bruce Atwater** has been appointed sales manager.

American Hammered Automotive Replacement Div., Sealed Power Corp. —**William B. Banta** has been named sales promotion manager.

Adds Tool Research, Fuel Tank Test

Believed to be the first of its kind in the aircraft industry, a manufacturing research unit has been formed in the Boeing Airplane Co. tool engineering department.

The former mechanical development unit was largely restricted to working on the development of fixtures, dies and tools requested by the shops. The new group will carry on independent research, work out entire processes and build sample tools and fixtures. It will work with committees which include members from planning, tool fabrication, parts fabrication, special tools and equipment, and inspection.

The new facility will be paid for by the Air Force but built by Boeing as a prime contractor. Designed as an addition to the present Boeing power plant test center, the new facility will include a building for the slosh test table, a stand test building for determining the weathering properties of fuel tanks, a laboratory building with facilities for refrigerating and testing fuel tanks. The slosh and vibration test table is designed to test full fuel tanks weighing up to 50,000 lb.

PRODUCTION *Proved* IN OVER 7,000 PLANTS

FOSTORIA *TOPS* ALL OVENS FOR HIGH EFFICIENCY

Eliminates Heat Waste . . Controls and Directs Heat Exactly as Needed . .

FINEST FINISH BAKE

SMOOTH "FLOW-OUT" OF PAINT
Uniformity of heat distribution and rapidity of solvent removal give smooth, even paint film.

THOROUGH UNIFORM BAKE
Near Infra-red energy penetrates paint film with constant uniform temperature.

CLEAN FINISH
No by-product of combustion — no condensation of solvent volatiles to mar finish.

SAFETY CONTROLLED
Instant heat shut-off with conveyor stoppage. No over-baking by shut-off lag.

STABLE PERFORMANCE
Unaffected by day-to-day weather conditions.

LOWEST BAKING COST

LOWEST OPERATING COST
Puts heat into the product — not into oven walls. Uses less fuel. Gold plated interior reduces heat loss to 2%. In many instances, Fostoria electric operation actually costs less than any other fuel.

REQUIRES LESS FLOOR SPACE
Shorter Cycles—most production for oven size. May be ceiling mounted.

FASTEST PRODUCTION
Fastest means of heat transfer. No warm-up required — no shut-off lag. Heat levels instantly changeable.

LOWEST MAINTENANCE COST
Clean operation — no combustion by-products. Lowest source replacement cost.

COMFORTABLE WORK CONDITIONS
No room ventilation problem.

COMPETITIVE INITIAL COST
Comparable to any quality-built oven.

Throughout industry, new high standards of efficiency are being set by utilization of modern Fostoria oven equipment. A Fostoria representative will gladly analyze your production needs and submit recommendations for your consideration.

INFRA-RED fostoria OVENS

THE FOSTORIA PRESSED STEEL CORP.
FOSTORIA, OHIO, Dept. I
Please send me information on Infra-red Ovens
for .....
Name .....
Company .....
Street .....
City ..... State .....

Sub-Zero Engine Starting

(*Continued from page 53*)

period. Extensive testing under simulated low temperature conditions confirmed theoretical values and indicated that such type of heating was within practical limits with respect to heat output, air flow, and electrical power requirements. A year later in conjunction with a development program for interchangeable, aircooled engines of 30, 60, 90, 150 and 200 hp, the system providing internal heat was further developed as applicable to these engines.

Arrangement of Units

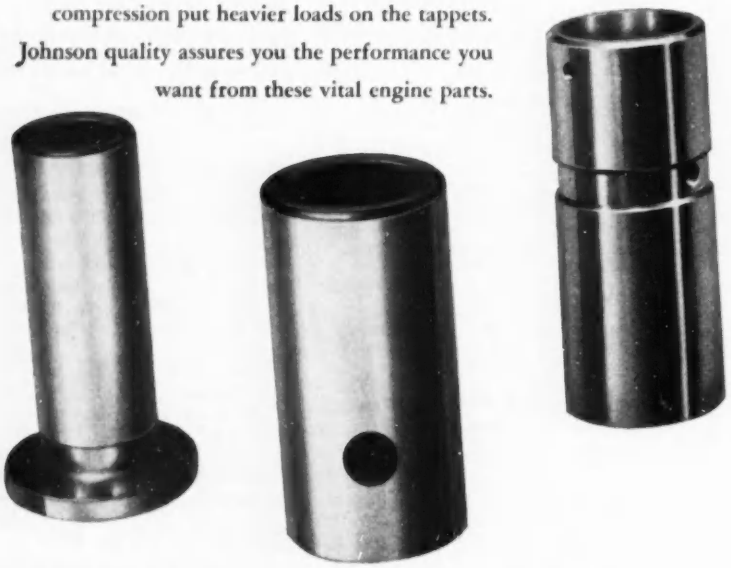
Figure 1 shows the heater and ducts mounted at the accessory end of an engine provided with facilities for internal preheating. Duct "A" is the heater outlet duct supplying air at a temperature of from 350F to 400F. This duct is connected to a distribution box "B," shown in cutaway. At the start of preheating, valve "C" is open since it is controlled by the engine oil pressure. Entering the accessory case, through this open valve, warm air contacts all accessory drives and then enters the crankcase through normal openings provided for lubrication purposes. Upon entering the crankcase, the warm air contacts all bearings, pistons, cylinder walls, etc., and leaves the crankcase through duct "D," Fig. 2, also controlled by a normally open butterfly valve energized by engine oil pressure. The air leaving this duct is discharged within the cowling enclosure and is returned to the heater "F" through duct "E" of Fig. 1. This allows further contact of outer engine surfaces with relatively warmer air, and aids in making full and efficient use of the heating air.

Advanced Type Heater

At this point it may be said that the heater shown is an early type which is presently being replaced with a heater of more advanced and compact design providing greater output within smaller dimensions. The exhaust gas of the heater is ducted through an integrally cast heat exchanger in the oil sump, providing a source of heat for the oil supply. When the oil has reached a safe starting temperature as indicated by a light or temperature gage, the operator merely presses the starter button. During cranking, oil pressure closes the accessory case inlet and crankcase outlet butterfly valves, thus sealing off the crankcase and diverting all the warm air to the induction system through controlled openings in the distribution box. Hence, the resulting quick vaporization of the fuel and reduced cranking torque by previous preheating allows an instant and positive start. Many starts were made at —65F without choking. Once started, the heater continued to supply warm air to the induction system until a thermal switch (not shown), installed on the exhaust manifold shroud, senses air at a predetermined temperature (approx. 100F) and turns off the heater. From this point on, warm air for the induction system is supplied from the exhaust manifold shroud through a duct and is thermostatically controlled by a temperature sensing spring "H," Fig. 2. Opening "J," Fig. 2, is the source of ambient or cold air which mixes with hot air

JOHNSON
Tappets
"fill the exacting requirements of today's engines"

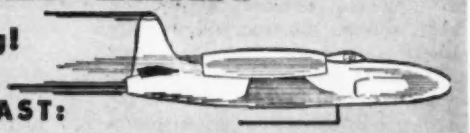
Higher horsepower and higher compression put heavier loads on the tappets. Johnson quality assures you the performance you want from these vital engine parts.



"Tappets are our business"
JOHNSON Jp PRODUCTS INC.
MUSKEGON, MICHIGAN

today, you're hardly aware of any **SPEED LIMIT** *

on surface broaching!



BUT HERE'S WHAT IT'S BEEN IN THE PAST:

6 fpm 1902

25 fpm 1922

60 fpm 1942

today 300 fpm . . . and more!

*Of course we're talking about the new LAPOINTE ELECTRO-MECHANICAL DRIVE horizontal BROACHING MACHINE

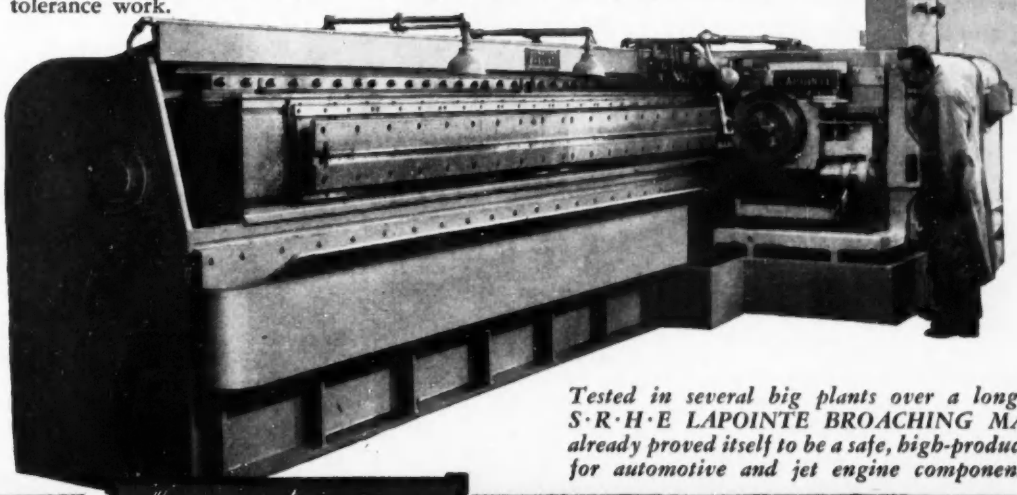
Enthusiastic approval of this new LAPOINTE BROACHING machine has been given by some of the best people — and best plants — in America! How? *They said it with orders!*

These orders came, because some plants wanted the greater flexibility and versatility now available through the Dual Speed and Dual Cycle (patented) features;

Some plants needed the higher production now possible in a modern high-speed broaching machine;

And all plants were delighted to know about the longer strokes that were available, **100" to 180",** providing single pass broaching operations for close tolerance work.

Write for new Technical Bulletin **SRHE-10**



Tested in several big plants over a long period, the S·R·H·E LAPOINTE BROACHING MACHINE has already proved itself to be a safe, high-production machine for automotive and jet engine components especially.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

from the exhaust shroud. During operation at high ambient temperatures above 70F to 80F, all the air for induction is supplied through opening "J." As the ambient temperature drops, warmer air from the exhaust shroud maintains a desirable intake air temperature to prevent carburetor icing, and aids in providing good vaporization of the charge. Thermostatically operated shutters at the underside of the shroud provide control of the cooling air to maintain normal engine temperatures over the load and temperature range.

By cycling the heater through a temperature-sensing control switch in the oil sump, standby heating of the engine is provided for circumstances requiring instant starting at any moment throughout the day or night.

Heat for Batteries

Battery heating during preheat or standby operation is provided from the same heater by connecting an additional duct to the heater outlet header. During recent tests, engines equipped with internal heating have been readily started from two 24 volt, 36 amp-hr batteries connected in parallel and with an electrolyte temperature of —30 F. During operation, battery heat is maintained by warm air supplied by the engine from the underside of the engine cooling shroud. This must be done since batteries will not accept a charge with electrolyte temperatures below —20F at the nominal charging voltage.

The simplicity of the installation can readily be seen from Figs. 1 and 2. Modifications to the engine involved casting changes in the accessory case and crankcase to provide air inlet and outlet openings. Oil galleries were tapped to provide oil pressure for automatic operation of air inlet and outlet valves. The distribution box "B," Fig. 1, is attached to the accessory case. The system lends itself to simple field installation of a winterization kit if proper provisions are made in the engine, and space allowances are made in the end item.

Used By Air Force

The internal heating system described is in extensive use by the Air Force for powered ground equipment such as fuel pumps, generator sets, hydraulic pumps, etc. Some engines have been started within 15 min after soaking for 48 hr at an ambient temperature of —65 F. Reports from the field in Arctic regions are very favorable and the effectiveness of the heating has been confirmed by field experience. It may be mentioned too, that once the engine is equipped to receive heat, the heat source may be at a remote location. Such an application is in use for auxiliary pump engines used in fire trucks. In such installation a remotely located heater furnishes warm air for standby heating of the engine as well as warm air for the cab. The heat exchanger in the oil sump of the engine is fitted for flowing warm coolant used in conjunction with maintaining the main propulsion engine on a standby basis.

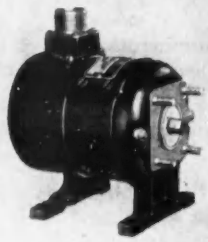
Several leading heater manufacturers have been encouraged to develop various sizes of electrically powered small, compact, warm air gasoline heaters. These are now available in small packages in capacities of 15,000, 30,000 and 60,000 Btu hr of clean air. Outlet air temperatures of these heaters are controlled to approximately 400 F.

Engine Power for Heater

For installations where battery power is limited, a small one hp,

COST . . .
COMPACTNESS . . .
PERFORMANCE . . .
All Often Improved with . . .

Lamb Electric
SPECIAL APPLICATION
FRACTIONAL HORSEPOWER
MOTORS



Intermittent high torque motor with low weight factor; for aircraft and many other applications.

• You may find, as have many other designers of motor-driven products, that the use of a special application Lamb Electric Motor will enable you to reduce costs.

Compactness . . . low weight . . . excellent performance — these are some of the other advantages obtained with Lamb Electric Motors, because they are *specially engineered* for the application.

Space factor in this power unit is minimized by having output shaft at right angles to motor shaft.

The Lamb Electric Company
Kent, Ohio
In Canada: Lamb Electric — Division of Sangamo Company Ltd.— Leaside, Ontario

THEY'RE POWERING
AMERICA'S *Finest* PRODUCTS

Lamb Electric
SPECIAL APPLICATION
FRACTIONAL HORSEPOWER MOTORS

Specify

N·A·X
HIGH-TENSILE STEEL

DECK HINGE

for

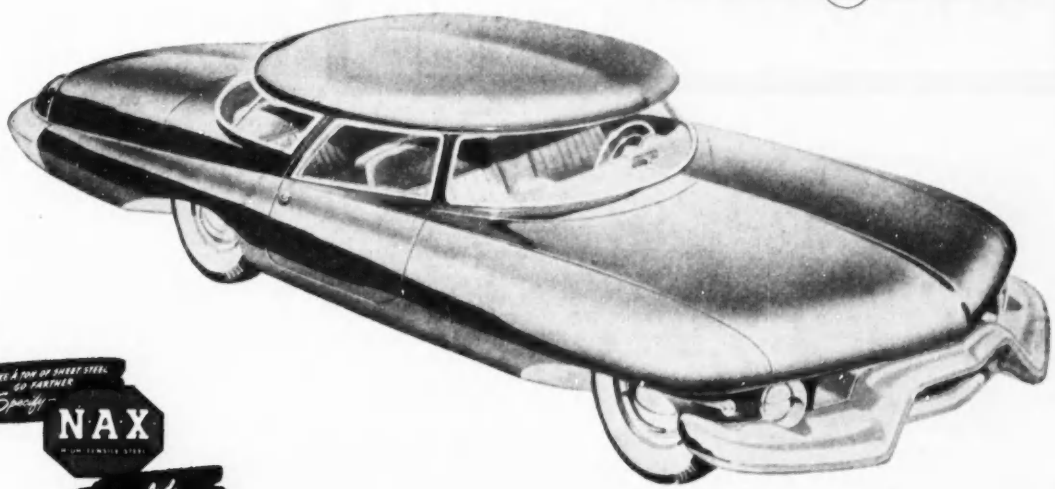
High Strength with Excellent Cold·Forming Properties

N-A-X HIGH-TENSILE, having 50% greater strength than mild carbon steel, permits the use of thinner sections —resulting in lighter weight of products. It is a low-alloy steel—possessing much greater resistance to corrosion than mild carbon steel, with either painted or unpainted surfaces. Combined with this characteristic, it has high fatigue and toughness values at normal and sub-zero temperatures and the abrasion resistance of a medium high carbon steel—resulting in longer life of products.

N-A-X HIGH-TENSILE, with its higher physical properties, can be readily formed into the most difficult stamped shapes, and its response to welding, by any method, is excellent. Due to its inherently fine grain and higher hardness, it can be ground and polished to a high degree of lustre at lower cost than can mild carbon steel.

Your product can be made lighter in weight . . . to last longer . . . and in some cases be manufactured more economically, when made of N-A-X HIGH-TENSILE steel.

GREAT LAKES STEEL CORPORATION
N-A-X Alloy Division — Ecorse, Detroit 29, Mich.
NATIONAL STEEL CORPORATION

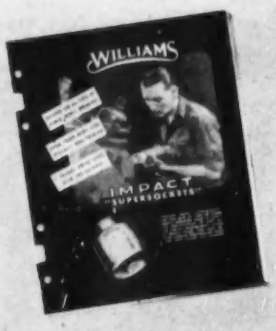


MAKE A TON OF SHEET STEEL GO FARTHER
Specify N·A·X
...And "MAKE YOUR PRODUCT LAST LONGER"

KEEP YOUR SCRAP MOVING TO YOUR DEALER

"How to Select the Right PRODUCTION Sockets"

REGULAR LENGTH SOCKETS	HEXAGON OPENINGS	3/16" to 7/16"	5/16" to 3/4"	3/8" to 1-1/4"	1/2" to 1-1/2"	1/2" to 1-11/16"	3/4" to 3-5/8"	1-5/16" to 3-1/2"
	SURFACE DRIVE OPENINGS	----	3/8" to 9/16"	7/16" to 7/8"	5/8" to 1-1/4"	----	----	----
	DOUBLE SQUARE OPENINGS	5/16" to 7/16"	5/16" to 5/8"	3/8" to 1"	9/16" to 1-1/8"	9/16" to 1-1/4"	3/4" to 2-3/4"	----
BOLT CLEARANCE LENGTH SOCKETS	HEXAGON OPENINGS	1/4" to 3/8"	5/16" to 5/8"	3/8" to 1"	9/16" to 1-1/16"	9/16" to 1-5/8"	3/4" to 2-3/8"	----
	SURFACE DRIVE OPENINGS	----	3/8" to 9/16"	7/16" to 13/16"	5/8" to 1"	----	----	----
	DOUBLE SQUARE OPENINGS	----	----	----	----	----	3/4" to 2-3/8"	----
SPECIAL SOCKETS FOR HARDENED TAPPING SCREWS	REGULAR	3/16" to 3/8"	5/16" to 9/16"	3/8" to 9/16"	----	----	----	----
	WITH CARBIDE INSERTS	1/4" to 7/16"	5/16" to 1/2"	----	----	----	----	----
ACCESSORIES AND ATTACHMENTS	EXTENSIONS (Lengths)	2" and 6"	3" and 6"	5" and 10"	6" and 10"	7", 10" and 13"	6" and 12"	6" and 12"
	HEX-SQUARE SHANKS (Size Hex)	1/4"	7/16"	7/16" or 5/8"	5/8" or 3/4"	3/4"	3/4"	----
	MAGNETIC SHANKS (Sockets to Fit)	1/4" to 3/8"	----	----	----	----	----	----
	ADAPTERS	----	----	----	----	3/4" F 1" M	1" M 3/4" F	----



The right IMPACT Sockets speed assembly, increase efficiency and cut costs. There are over 500 sockets and accessories in the complete Williams line. You will find adaptions for all types of power wrenches . . . impact, and single or multiple nut runners. They can also be used with Williams hand drivers.

The simplified check chart here, together with Catalog A-100 make a convenient guide in selecting the best to use in your operation. Your industrial supplier can fill your requirements from local stock.

A request on your company letterhead will bring you Catalog A-100.

J. H. WILLIAMS & CO.

529 Vulcan Street **Buffalo, N.Y.**

Be Wise... Buy WILLIAMS IMPACT "Supersockets"

single cyl, two-stroke engine is used to power the heater. The engine has been modified for low-temperature operation, and starts are made within a few minutes at temperatures down to —65 F. A blower which furnishes ventilating and combustion air for the gasoline heater is integrally mounted to the engine, forming a compact assembly. Long continuous standby heating therefore is possible with an engine-driven heater, where conditions demand immediate readiness of the equipment.

Application of internal heat to liquid-cooled Diesel and gasoline engines of various types and sizes is being accomplished by some heater manufacturers. One heater manufacturer reports encouraging results in Diesel engine applications. Internal heating is not limited to engines. It may also be used for compressors, gear cases, transmissions, and other types of machinery which become inoperative due to congealed oil at low temperature. It is expected that wide use of such a system will be made in the future since there are many advantages to be gained. Further development contributing to greater effectiveness and simplicity can be anticipated as experience increases with various types of engnes and field conditions.

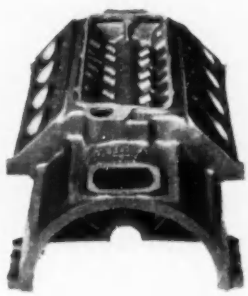
Fast Roll-Spot Technique

(*Continued from page* 47)

For spaced-out spot welding, the new technique is equally satisfactory. In spot welding a General Electric J-47 jet engine tail-pipe Ryan installs 300 spot welds on one-in. centers in one seam. These can be installed at 68 in. of seam per minute compared with the former rate of only 21 ipm under standard methods. With improvements now being developed, speeds of 80 ipm will be realized. This reduction in time allows Ryan to spot weld five of these assemblies in the same time which was required to do two with previous means.

Economically, the innovation presents an attractive picture. The Taylor-Winfield accessory drive costs about 15 per cent of the cost of a new machine. For that amount, it is quite possible to get twice the capacity from a machine—making it perform the work of two, without devoting added personnel or floor space to the job.

They're pouring horsepower into smaller packages



Stallions of industry, harnessed to pull a mighty load . . . that's horsepower in a V-type engine. With this unique design, more power is concentrated in less space . . . put to work with greater efficiency. Almost 40 years ago Campbell, Wyant and Cannon poured its first V-shaped cylinder block – helped give heart to this now famous power plant. Since then advances have been many, with CWC sparking the way – *building more V-type cylinder blocks than any other independent contract foundry.* Teaming its long experience with a constant search for the new and better, CWC gives V-type engine builders cylinder blocks that possess finest physical properties . . . that lengthen engine life, step-up engine performance. Next time you think of castings . . . think of CWC. Learn what a difference the *right* casting can mean to your product.

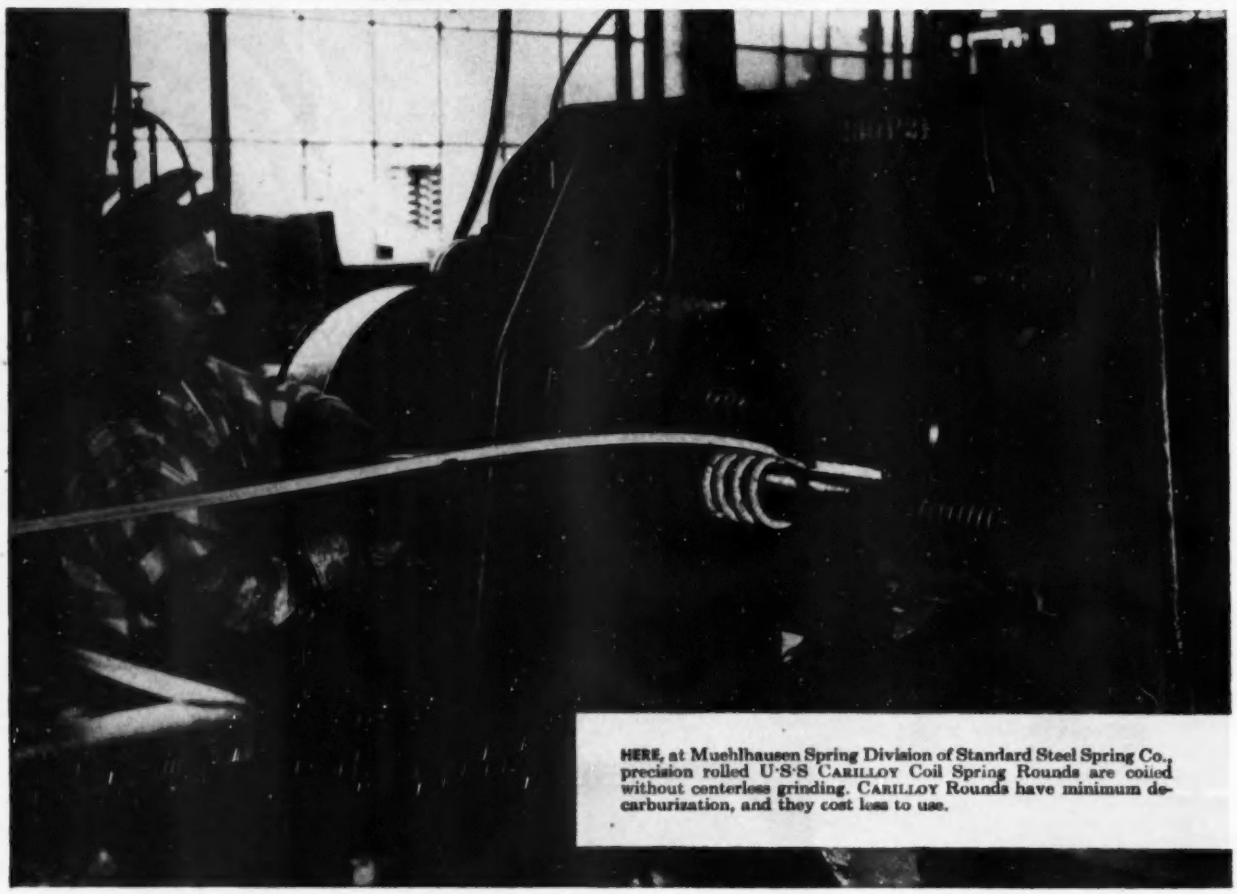
CWC

Since 1908

CAMPBELL, WYANT AND CANNON
FOUNDRY COMPANY, Muskegon, Michigan
Manufacturers of Gray Iron, Alloy Iron, and Steel Castings

Half the new cars

U·S·S Carilloy



HERE, at Muehlhausen Spring Division of Standard Steel Spring Co., precision rolled U·S·S CARILLOY Coil Spring Rounds are coiled without centerless grinding. CARILLOY Rounds have minimum decarburization, and they cost less to use.

have coil springs made of *precision rolled* rounds...

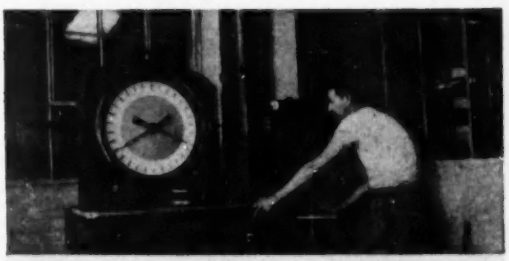
...twice as accurate as ordinary hot-rolled bars
...practically eliminate centerless grinding...cost less to make

IN the early days of the development of coil springs for front suspensions of automobiles, the only steel that was available was an ordinary hot-rolled bar from which as much as .035" of metal per side had to be removed by grinding to insure freedom from harmful seams, pits, and decarburization. This cost money, was wasteful and time consuming.

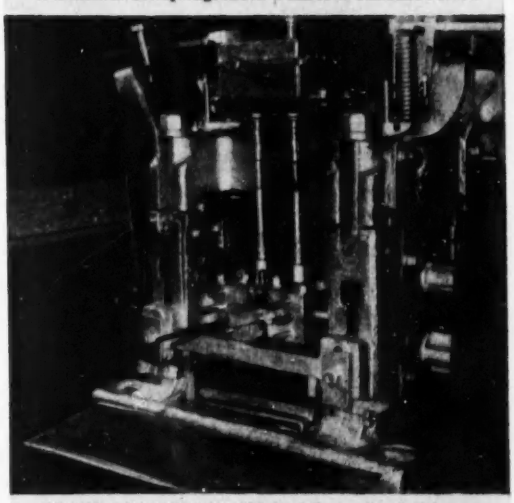
This seemed to be an expensive approach to a simple problem, so United States Steel equipped one of its mills to produce hot-rolled bars so free from harmful defects that most of the grinding expense could be eliminated. A method was devised for rolling a bar to half the standard tolerances, with half or less the amount of decarburization, which made it attractive to use the material "as furnished" or with a small amount of centerless grinding. We call this bar a Precision Rolled Coil Spring Round. It has performed excellently when used "as furnished" or with a small amount of grinding.

This exclusive development has paid off in two ways. It paid us because the CARILLOY Precision Rolled Coil Spring Round is now used in over half of the coil springs in new automobiles. But, most of all, it has paid off for the automobile manufacturer in that his costs are reduced with performance of the highest order. Today we are still hard at work developing new and better alloy steels for other new uses in automobiles; for example, in automatic transmissions, power steering units and other new and vital automobile parts.

Our experienced engineers and metallurgists will be glad to consult with *you* on any steel or fabrication problem. Just write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



COIL SPRINGS made of CARILLOY Precision Spring Rounds are uniform as proven in severe laboratory tests, as well as in actual service on America's best automobiles. They perform so well that half of all automobile coil springs are now made of CARILLOY steel.



AT THE GARY WORKS of United States Steel, this precision mill rolls CARILLOY Coil Spring Rounds with extreme accuracy. Tolerances are half of standard; .004" on the diameter, instead of the usual .008", and only .006" out of round, compared to .012" on ordinary rolled bars.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH — COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

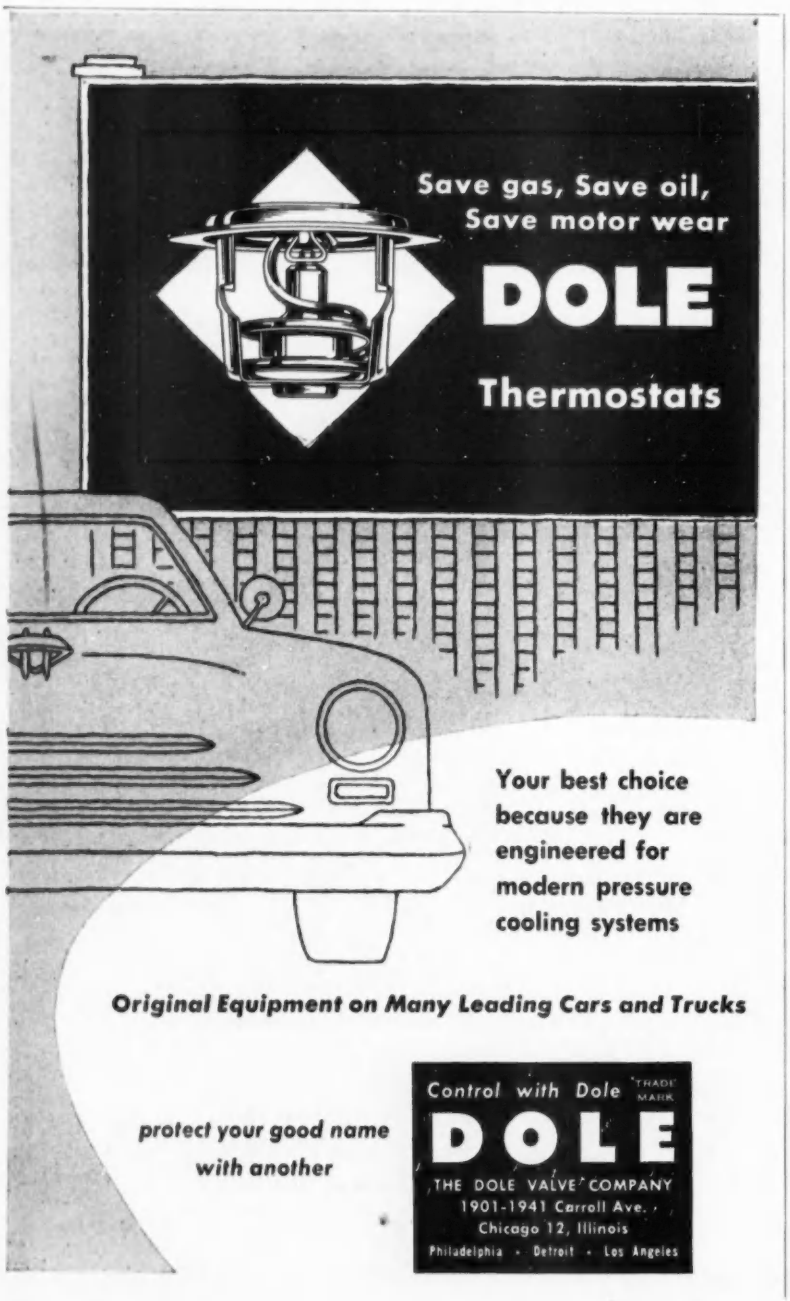
3-1408

UNITED STATES STEEL

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to June 25, 1953, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which were published in the July 15 issue, page 118, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Defense Production Administration, June 25, 1953, to July 24, 1953.

Included in this latest tabulation, 17,601 new or expanded defense facilities of all types have been authorized for rapid tax write-offs, the total amount eligible for amortization, being $27,493,474,000. These figures are exclusive of cases that are up for later review but included in this list —in these cases no dollar amount is listed. The figure appearing in parentheses is the percentage authorized for actual fast tax write-offs.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Save motor wear
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Your best choice because they are engineered for modern pressure cooling systems
Original Equipment on Many Leading Cars and Trucks
protect your good name with another
Control with Dole TRADE MARK
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THE DOLE VALVE COMPANY
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Chicago 12, Illinois
Philadelphia • Detroit • Los Angeles

—A—

Aeroquip Corporation, Jackson, Mich.
Aircraft parts—$91,862 (70)

Alpha Tool Works, Detroit, Mich.
Aircraft parts—$9,795 (70)

Aluminum Taper Milling Co., Inc., El Segundo, Calif.
Tapered aluminum sheets for aircraft—$114,192 (80)

American Locomotive Company, Auburn, N. Y.
Railroad equipment—$291,927 (50)

American Locomotive Co., Dunkirk, N. Y.
Heat exchangers—$287,275 (65)

American Machinery Corp., Orange Co., Fla.
Ordnance—$55,150 (45)

American Non-Gran Bronze Company, Berwyn, Pa.
Aircraft parts—$37,958 (70)

—B—

Basic Metals, Inc., Montebello, Calif.
Aircraft components—$15,700 (70)

Bell Aircraft Corp., Fort Worth, Texas
Military helicopters—$250,000 (60)

Bendix Aviation Corp., Sidney, N. Y.
Aircraft components—$458,443 (40)

Bendix Aviation Corp., Davenport, Iowa
Aircraft components—$88,235 (50)

Bock Manufacturing Co., Farmingdale, N. Y.
Aircraft parts—$8,305 (70)

Boeing Airplane Co., Wichita, Kans.
Aircraft—$12,979 (65)

Bowden Grinding, Inc., Cleveland, Ohio
Aircraft parts—$10,055 (70)

—C—

The Cessna Aircraft Co., Wichita, Kansas
Aircraft & parts—$69,722 (60)

Curtiss-Wright Corp., Wood-Ridge, N. J.
Aircraft & engines—$22,513 (65)

—D—

Douglas Aircraft Co., Inc., Santa Monica, Calif.
Aircraft—$110,000 (80)

Hunter Douglas Corp., Riverside, Calif.
Ordnance—$286,097 (50)

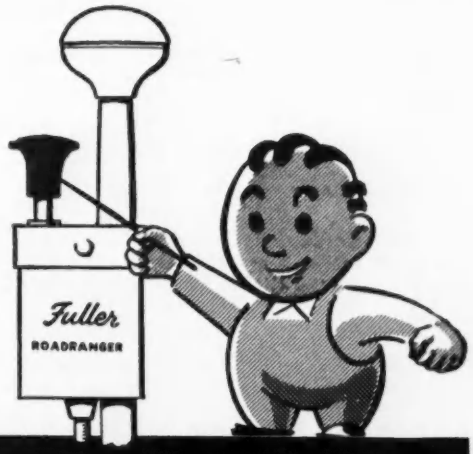
Dundick Tool Works, Chicago, Ill.
Aircraft parts—$10,199 (70)

—E—

Easy Washing Machine Corp., Syracuse, N. Y.
Ordnance—$3,000,000 (40)

(*Turn to page* 104, *please*)

...take your choice



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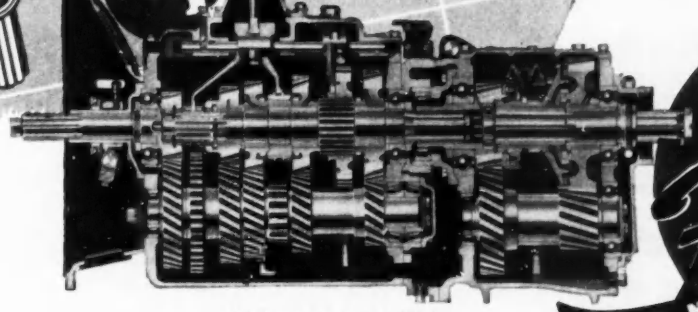
Leading fleets have proved the Fuller ROADRANGER in gruelling service . . . and more and more fleets are specifying this 10-speed, one-lever transmission. Here's why:

1. No gear splitting—10 selective gear ratios, evenly and progressively spaced. **2.** Easier, quicker shifts—28% steps—one shift lever controls all 10 forward speeds. **3.** Higher average road speed—engine operates in peak hp range with greater fuel economy. **4.** Less driver fatigue—*i. e.* less shifting. **5.** Range shifts pre-selected—automatic and synchronized. **6.** More compact than other 10-speeds. **7.** More cargo on payload axle.

Available in Models R-95-C and R-950-C (overdrive)



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FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

Unit Drop Forge Division, Milwaukee 1, Wis. • WESTERN DISTRICT OFFICE (SALES & SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

(*Continued from page* 102)

Economy Screw Mach. & Metal Products Mfg. Co., New York, N. Y.
Machining of aircraft parts—$10,250 (70)

Thomas A. Edison, Inc., West Orange, N. J.
Scientific instruments for aircraft—$30,333 (65)

Ekco Products Company, Whittier, Calif.
Ordnance—$110,000 (40)

Elbeeco, Inc., Jackson, Mich.
Aircraft parts—$61,049 (70)

Empire Tool Products, Inc., Garden City, N. Y.
Component parts for jet engines—$9,150 (70)

—F—

Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.
Aircraft parts—$12,850 (65)

—G—

General Metals Corp., Huntington, W. V.
Aircraft parts—$2,000,000 (65)

Glenview Metal Products Company, Delanco, N. J.
Machining of aircraft & ordnance parts—$44,748 (70)

Goodyear Aircraft Corp., Litchfield Park, Ariz.
Airship parts—$86,990 (65)

Goodyear Aircraft Corp., Akron, Ohio
Aircraft & parts—$544,835 (65)
Airships—$41,250 (65)

—H—

Hoover Electric Company, Los Angeles, Calif.
Aircraft components—$46,662 (70)

—J—

Johns-Manville Corp., Manville, N. J.
Aircraft parts—$160,205 (65)

—K—

Kent Manufacturing Corp., Chestertown, Md.
Ordnance—$10,500 (45)

Walter Kidde & Company, Inc., Belleville, N. J.
Aircraft equipment—$319,552 (65)

—L—

Land-Air, Inc., Chicago, Ill.
Electronic equipment—$4,843 (70)

Lear, Inc., Grand Rapids, Mich.
Aircraft parts—$12,689 (65)

Lockheed Aircraft Corp., Burbank, Calif.
Aircraft & spare parts—$65,514 (60)

H. W. Loud Machine Works, Inc., Pomona, Calif.
Aircraft assemblies—$232,011 (70)

—M—

The Glenn L. Martin Company, Baltimore, Md.
Aircraft—$18,781 (65)

Meisel Press Mfg. Company, Boston, Mass.
Aircraft parts—$18,000 (70)

Michigan Molded Plastics, Inc., Dexter, Mich.
Ordnance—$25,000 (45)

The Murray Ohio Mfg. Co., Cleveland, Ohio
Ordnance—$14,922 (65)

—N—

The National Plastic Products Co., Odenton, Md.
Ordnance—$255,500 (45)

National Pressure Cooker Co., Minneapolis, Minn.
Aircraft parts—$25,420 (65)

National Utilities Corp., Pasadena, Calif.
Aircraft clamps & couplings—$86,844 (60)

(*Turn to page* 108, *please*)

Chicago RIVET "912"
AUTOMATIC RIVET SETTER
CUTS COSTS 3 WAYS

1 FASTENS FASTER . . .
Only the speed of the operator limits the 912's riveting speed. Completely automatic. A push on the foot pedal automatically feeds, inserts and clinches the rivet.

2 DOES WORK OF SEVERAL MACHINES
Quick change rotary hopper and raceway makes the 912 adjustable in 5 to 10 minutes to set different size rivets. Adjustable anvil height and 12-inch throat provide further versatility.

3 SAVES ON MAINTENANCE . . .
The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.

If your assembly calls for 3/16" steel tubular rivets or smaller, of 15/16" lengths or less, ask us to show you how the 912 can cut your fastening costs. Send a sample of your problem assembly (or blueprint) for a free fastening analysis.

FREE CATALOG
contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

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9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
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Because they remove bearing *length* as a limiting factor in engine design, Moraine-400 bearings help to make more compact engines of higher horsepower possible.

For example . . . one of our customers is now developing an engine that will have impressively greater output without greater bulk. Its features include a stiffer crankshaft, larger pistons, more rigid connecting rods . . . and, because Moraine-400s are being used . . . *narrower bearings!* In addition, tests indicate that bearing life will be increased as much as *400 per cent!*

May we suggest that your engineers consider Moraine-400 bearings in designing and developing your engines of the future.

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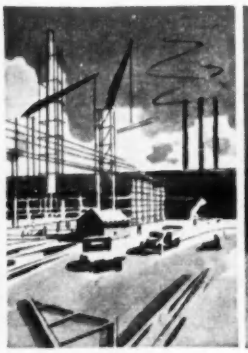
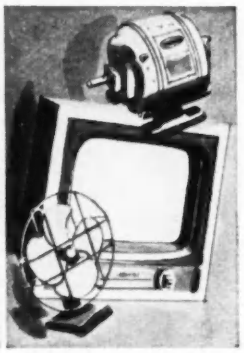


GENERAL INDUSTRY



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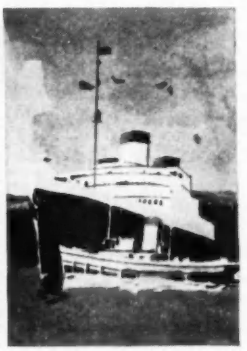

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IMPORTANT APPLICATIONS

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CORPORATION
BOX 488 • MIDDLETOWN, OHIO

(*Continued from page* 104)

Niles-Bement-Pond Company, Warwick, R. I.
Aircraft engine accessories—$111,271 (65)

Northrop Aircraft, Inc., Hawthorne, Calif.
Aircraft & aircraft parts—missiles—$233,930 (60)

—O—

The Oliver Corp., Battle Creek, Mich.
Components for military end items—$25,348 (65)

—P—

P. M. Industries, Inc., Stamford, Conn.
Ordnance—$150,000 (45)

Parish Pressed Steel Company, Reading, Pa.
Components of military vehicles—$1,126,795 (45)

Parsons Tool Company, Berlin, Conn.
Aircraft parts—$15,147 (70)

S. F. Petyus Engineering, Inc., Los Angeles. Calif.
Permanent molds for aircraft castings—$15,826 (55)

Pioneer Tool & Engineering Co., Chicago, Ill.
Ordnance—$40,106 (70)

Plane Parts, Inc., New Haven, Conn.
Aircraft parts—$28,076 (70)

Prospect Mold & Die Co., Cuyahoga Falls, Ohio
Ordnance—$20,947 (70)

—R—

Republic Aviation Corp., E. Farmingdale, L. I., N. Y.
Aircraft spare parts—$152,000 (40)

Rocket Jet Engineering Corp., Glendale, Calif.
Precision machining of aircraft parts—$6,816 (70)

Ronson Art Metal Works, Inc., Newark, N. J.
Aircraft components—$31,359 (65)

The Ryan Aeronautical Co., San Diego, Calif.
Airplane parts—$28,225 (65)

—S—

Swedlow Plastics Co., Los Angeles, Calif.
Aircraft parts—$12,357 (70)

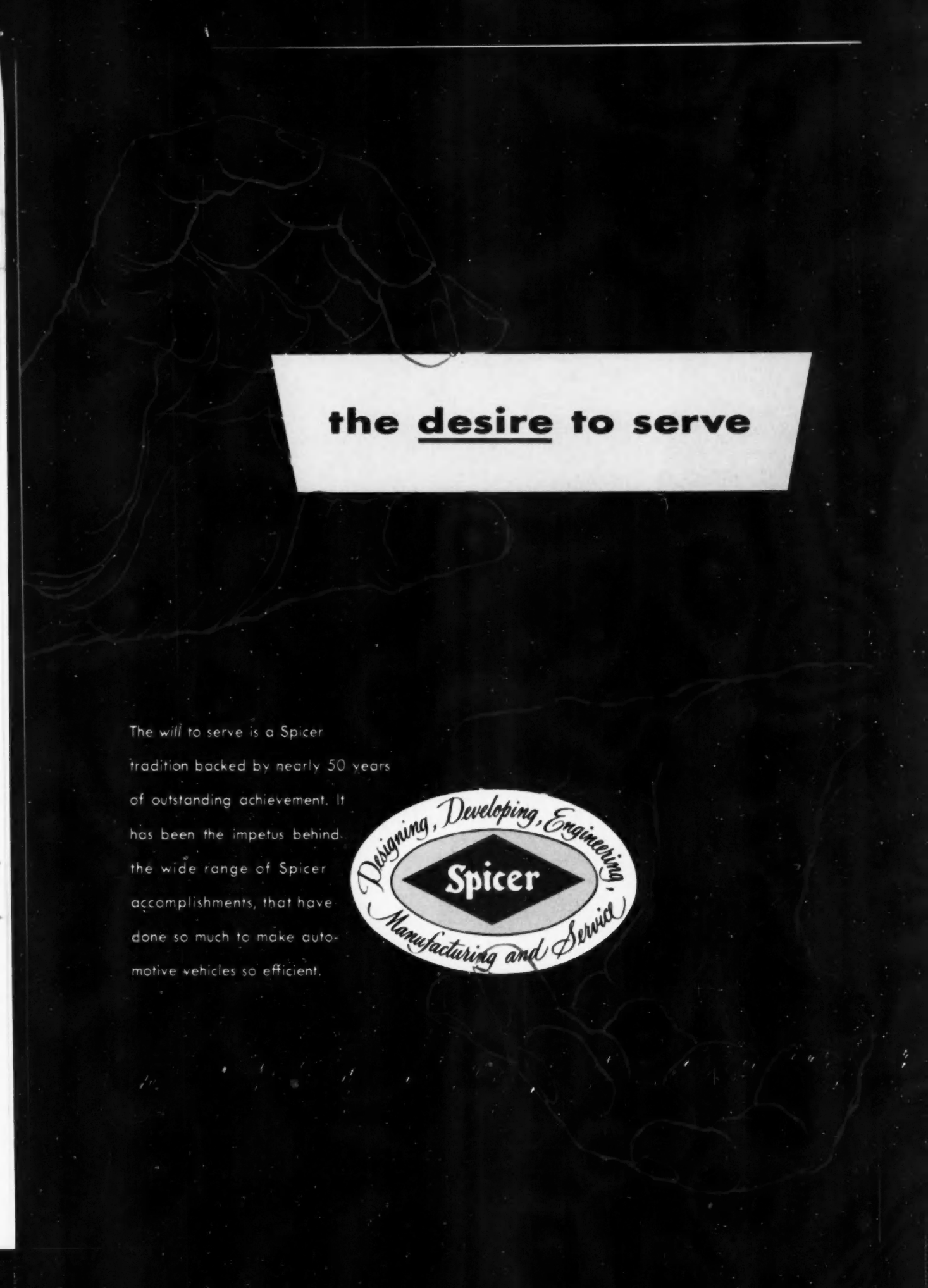
—T—

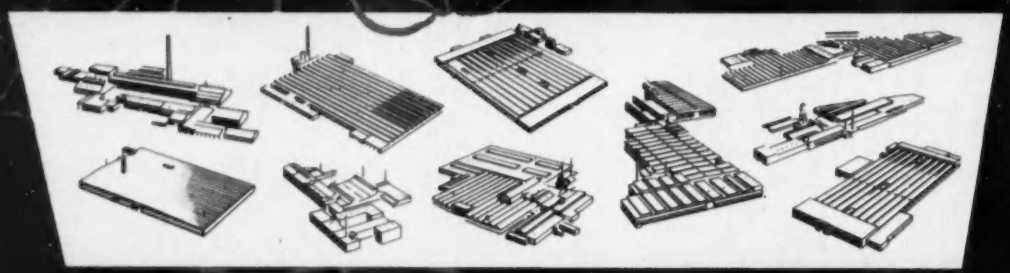
Temco, Inc.. Nashville, Tenn.
Ordnance—$80,150 (45)

—U—

United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Aircraft engines—$3,360,000 (65)

(*Turn to page* 111, *please*)


the desire to serve
The will to serve is a Spicer tradition backed by nearly 50 years of outstanding achievement. It has been the impetus behind the wide range of Spicer accomplishments, that have done so much to make automotive vehicles so efficient.
Designing, Developing, Engineering,
Spicer
Manufacturing and Service



the ability to serve

The Spicer *will* . . . plus Spicer skill and resources . . . form a strong *ability* team. Ten modern plants, geared to modern manufacturing tempo, are producing equipment that is the Standard of the Industry. We are prepared to design, develop, engineer and manufacture . . . with a high degree of excellence . . . your special needs in power transmission units.

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PASSENGER CAR AXLES • STAMPINGS • SPICER "BROWN-LIPE" GEAR BOXES • PARISH FRAMES
TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES
RAILWAY GENERATOR DRIVES • WELDED TUBING

(*Continued from page* 108)

United Aircraft Corp., Windsor Locks, Conn.
Aircraft components—$261,200 (60)
United Aircraft Products. Inc., Dayton, Ohio
Aircraft parts—$124,780 (50)

—V—

Vinco Corporation, Detroit, Michigan
Aircraft assemblies—$140,280 (45)
The Voss Company, New Haven, Conn.
Aircraft components—$12,252 (70)

—W—

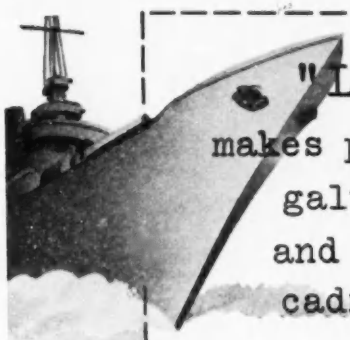
Waldorf Instruments Corp., Huntington, N. Y.
Aircraft parts—$24,292 (70)
Wells Aircraft Parts Co., Los Angeles, Calif.
Aircraft components—$80,802 (70)
Westholt Manufacturing, Inc., Wichita, Kans.
Aircraft parts—$11,370 (45)
Aircraft parts—$13,912 (70)

—Z—

Zul Machine Works, Inc., Lindenhurst, N. Y.
Aircraft components—$8,522 (70)

BOOKS . . .

FILING MANUAL FOR AIRCRAFT CORRESPONDENCE, *by L. P. Bradley, Jr., published by L. P. Bradley, Jr., 2328 Rockdale Ave., Normandy 21, Mo. Price, $5.50.* The author has written and published this manual in answer to the crying need for a guide to assist file clerks, secretaries, librarians, office managers, and others concerned with the filing and findings of aircraft correspondence. This manual is an attempt to provide such a guide and to describe procedures which may be used in an aircraft filing department to provide an effective method of handling technical correspondence from the time it is written until it is placed in permanent record storage or destroyed. Engineers may easily use the system described in this manual, due to the fact that the folders are broken down according to the engineer's breakdown of the aircraft itself. In addition, the system was developed by the author in close association and consultation with many aircraft engineers, and as a result, the system may be considered an engineer's filing system for aircraft correspondence, and yet may be easily and successfully used by any non-technically trained person. The system described covers many types of aircraft such as airplanes, helicopters, guided missiles, airships, gliders, etc. It also covers three sizes of files or filing departments; namely, large, medium, and small. Similarly, the system is not limited to the exact folders listed, but, due to its alphabetical nature, it may be expanded with additional folders as needed.



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makes paint stick to galvanized iron and other zinc or cadmium surfaces

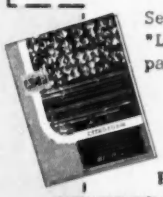
PROBLEM:

To eliminate the peeling of paint from zinc and zinc-coated structures or products.

SOLUTION:

Treat all zinc surfaces with "LITHOFORM" before painting. "LITHOFORM" is a liquid zinc phosphate coating chemical that can be applied by brushing or spraying at the Yard, or by dipping or spraying in industrial equipment. "LITHOFORM" forms a durable bond for paint. It is economical; it eliminates frequent repainting; it protects both the paint finish and the metal underneath.

ACTION:



Send for our new descriptive folder on "LITHOFORM" and for information on your own particular metal protection problem.

"LITHOFORM" meets Government Specifications. Specify "LITHOFORM" for all painting and refinishing work on zinc and zinc-coated surfaces.

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Please send me a free copy of your descriptive folder on "LITHOFORM."

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COMPANY NAME.....

ADDRESS.....

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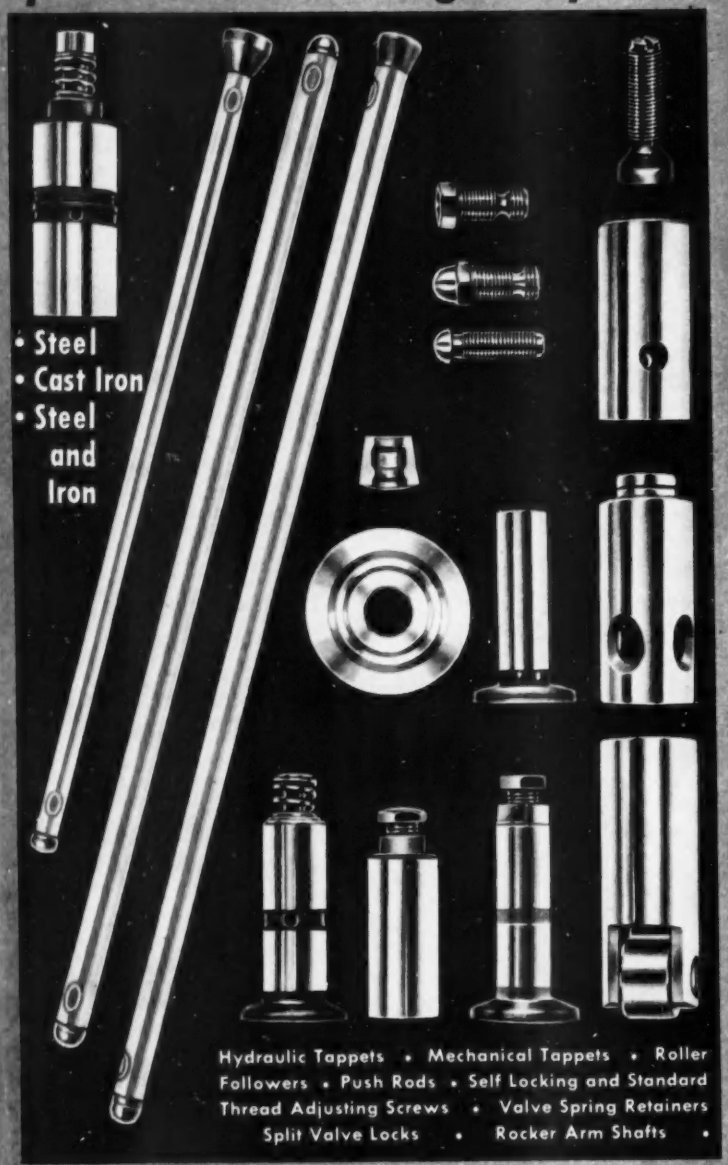
precision valve gear parts



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Cylinder Head Studs.....Cylinder Head Cap Screws
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Oil Pump to Distributor Shafts.....Remote Control Levers
Automatic Transmission Valves.....Water Pump Shafts

Special Screw Machine Parts 1/16" to 8" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products.

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

Air Starters for Commercial Vehicles

(*Continued from page* 49)

Recommendations for air tank or receiver size vary from four to six cu ft. This depends primarily on the physical requirements of existing vehicles. The Mack production models are utilizing six cu ft capacity tanks, and it is felt that this size will be the most widely used for production highway vehicles. All vehicle makers as well as Ingersoll-Rand agree on tanks with a working pressure of at least 150 psi. Depending on the type of engine and size of starter being used, the air starters may require from 40 psi to 150 psi for operation.

Normal tank fittings in addition to the lines for the compressor and starting motor include two valves for emergency use. One of these is of the Schrader tire valve type and the other is of the glad hand variety. The spring loaded Schrader type provides for filling the tank from external air compressor lines, while the glad hand valve is used for inter-truck exchange. This arrangement is particularly convenient for turning over the engine in cold weather.

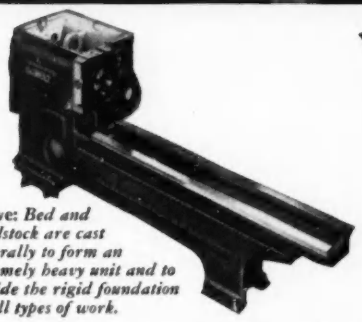
By equipping the starting system air tank with a by-pass valve to the brake air tank, an auxiliary source of air is then available for emergency stops or constant downhill braking. This feature has been added by several operators, according to reports from the field.

For starter operation, a quick-acting throttle valve is utilized. According to preference, this may be operated by a manual release or by a solenoid. The throttle should always be opened rapidly, as engagement of the Bendix pinion depends on sudden starting of the air motor.

Another item which should be placed in the air starting system is a water and oil separator. Both the throttle valve and the lubricator should be placed as close to the starting motor as possible. A check valve between the compressor and the tank should be incorporated in the system to prevent loss from the air receiver.

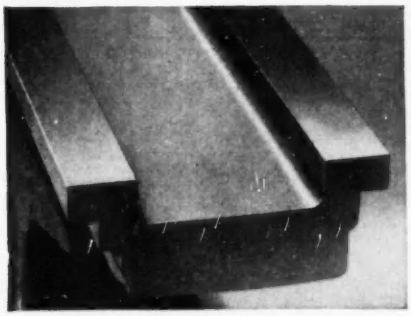
Test run with an Ingersoll-Rand Model 9BM air starter showed that the starter consumes about one cu ft of air at atmospheric pressure, per start. This was based on an installation on a 200 hp Cummins Diesel

(*Turn to page* 114, *please*)



Above: *Bed and Headstock are cast integrally to form an extremely heavy unit and to provide the rigid foundation for all types of work.*

Below: *Block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".*



ACCURACY THAT DOESN'T "WEAR OFF"

Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and maintain—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid support possible.

Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

(*Continued from page* 112)

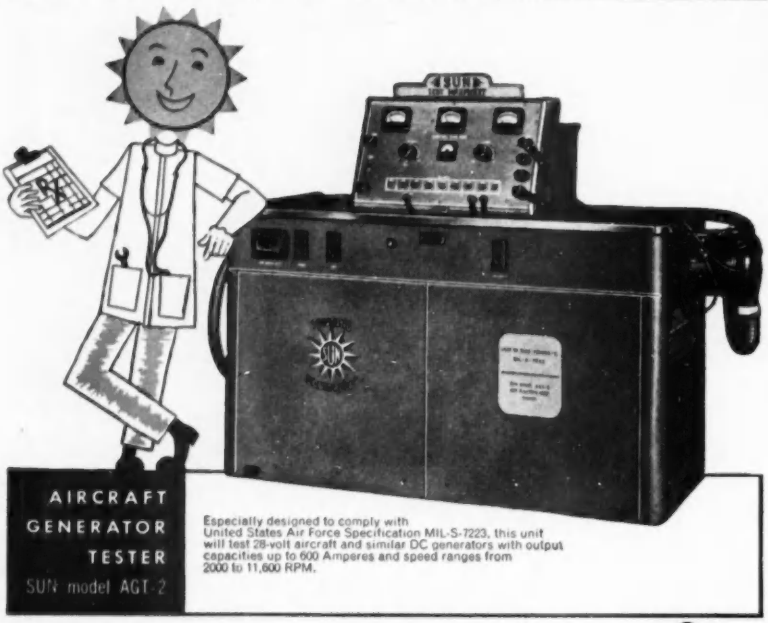
used to power a 6000 gal gasoline transport. The air receiver used had a 3.82 cu ft capacity and the air pressure used was 120 psi. Fifteen starts were made, against full engine compression of 15.5 to 1, and the air pressure dropped from 120 psi to 70 psi. When the engine compression was released, five additional starts were made which dropped the pressure down to 50 psi. This test of 20 consecutive starts was made in about five to six min.

Using the 3.82 cu ft air tank as a basis for calculation, disregarding the volume of the air brake system tank and lines, and the small amount of air pumped by the compressor during the few seconds of starting, a total of 13 cu ft of free air was consumed in the first 15 starts against compression. For the additional five starts, five cu ft of free air was used.

In another test to check air loss on the same truck after the vehicle had been idle 12 hr, the air brake system dropped from 120 psi to 35 psi and the air starting system dropped from 120 psi to 112 psi.

Currently two models of air starters are being made, the size 9BM and the 20BM. The 9BM is capable of delivering from seven to 16 hp, while the larger 20BM delivers from 19 to 41 hp.

At 100 psi, the 9BM starter delivers nine hp, 45 lb-ft torque, and the starter pinion has a speed of 2000 rpm. At the same air pressure, the 20BM starter has an output of 26 hp with a torque of 93 lb-ft. This provides a pinion speed of 2900 rpm.


AIRCRAFT
GENERATOR
TESTER
SUN model AGT-2
Especially designed to comply with United States Air Force Specification MIL-S-7223, this unit will test 28-volt aircraft and similar DC generators with output capacities up to 600 Amperes and speed ranges from 2000 to 11,600 RPM.

industry's leaders depend on Sun

. . . for special-order, built-to-specification scientific test equipment . . . Sun Electric Corporation is the world's largest manufacturer of Automotive and Aircraft Electrical and Electronic Testing Equipment, supplying approximately 70% of the testing equipment of this type to U.S. automotive dealers. That is why the leaders in every branch of the industry look to Sun as the logical choice to design and build special scientific equipment to meet their particular testing needs. The unit pictured is an example of a test problem solved with such specially designed equipment. Other Sun special-order units are in use in car, truck and tractor factories, aircraft and ordnance plants and in the factories of engine and component parts manufacturers everywhere. In production testing, spot checking and in quality control of material these special Sun Testers offer a high speed simplified operation that will save thousands of dollars and many production headaches.

Sun Engineers will be glad to discuss the design of special test equipment that can solve *your* testing problems too! Write TODAY for the Sun SPECIAL TEST EQUIPMENT Catalog.

Sun Equipment is available in 6-12-24 volt units.

117

Sun ELECTRIC CORPORATION
6373 AVONDALE AVE., CHICAGO 31, ILLINOIS

BOOKS . . .

1952 BOOK OF ASTM STANDARDS, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Prices: Complete Set, $76; Part 1, $12.00; Part 2, $10.00.* With over 9975 pages, including the more than 2001 standards, specifications, tests, and definitions for materials, the 1952 edition of this book has been issued in seven parts, the first two of which are devoted to ferrous and non-ferrous metals, respectively. Each part is complete with detailed subject index, two tables of contents, and arranged to provide technologists and others in industry and the Government with as usable a book as possible.

ASTM MANUAL ON MEASUREMENT AND SAMPLING OF PETROLEUM AND PETROLEUM PRODUCTS, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $1.50.* The second edition of this manual presents the latest and most practical measurement practices that are widely used today. It comprises seven ASTM standards but with considerable additional explanatory and descriptive material. The book provides recognized methods of measuring and computing oil in storage tanks of various types and for getting typical samples. All except one of the methods are presented in revised form.

SYMPOSIUM ON FATIGUE WITH EMPHASIS ON STATISTICAL APPROACH, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $2.00* Measurements made to determine the physical properties of materials usually exhibit more or less variation in the results obtained with different specimens. The authors of the papers in this symposium give special attention to the variation associated with their material and to their measurements. In this respect, these papers add their weight to a developing trend in experimental investigations.

ASTM STANDARDS ON PLASTICS, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $5.25.* This 705-page book gives a large number of standards, including specifications, definitions and tests for a wide range of plastics. The 27 specifications cover quite a wide range of molding compounds such as phenolic, polystyrene, melamines, ureas, cellulose, acetates, vinyl chloride, methacrylate, and materials made from these compounds in the form of sheets, rods, tubes and shapes. The large number of test methods are arranged in a broad range of classifications.

Handle this like a one piece ring

MUSKEGON "UNITIZED" STEEL OIL CONTROL RINGS

Here's a *multiple-piece* oil control piston ring that offers all the handling and installation speed and ease of a *one-piece* ring. It's Muskegon's *new*, exclusive "UNITIZED" piston ring with rails and spacer . . . pre-assembled . . . and BONDED TOGETHER!

You can dangle it from your finger—the components will *not* separate—not until the ring is in the engine!

Think of the time-saving benefits for both Production line and Service Shop installation.

Because it's "unitized," there's no fumbling with the components—it can be inserted like a one-piece ring, it's always *correctly* assembled assuring *right* order, and it can be compressed like a one-piece ring! Yes, sir! Whether it's handling or installation, nothing can equal the time-saving and convenience advantages of this ring.

Thoroughly field proven, the Muskegon "UNITIZED" Steel Oil Control Piston Ring is expected to become the choice of leading engine builders!

Our engineers will be happy to counsel with you. Write today. Muskegon Piston Ring Co., Muskegon, Michigan.

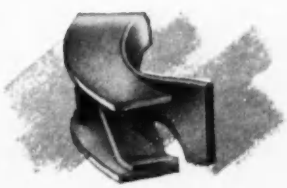
BONDING AGENT DISAPPEARS DURING ENGINE RUN

Muskegon uses a special, bonding adhesive that dissolves completely in the hot engine oil during the first engine run. The pieces are then free to perform as they should.

AVAILABLE WITH OR WITHOUT CHROME

CSR-200 with fully chrome plated edges assuring *double to triple ring life*. Self cleaning and non-clogging design.

CSR-100 without chrome edges. Quick seating—reduces drag to minimum—spacer well vented for free oil flow.



Muskegon "UNITIZED" Oil Control Ring consists of: spacer, two rails and heavy duty expander.

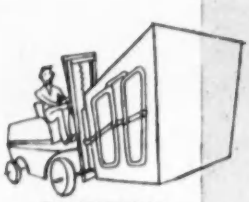
MUSKEGON Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

DETROIT OFFICE 321 New Center Bldg.
Telephone Trinity 2-3113

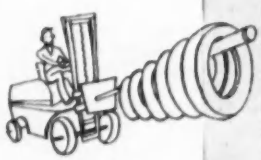
Have You Explored All the Ways To Save Money With a Fork Truck?

WOULDN'T IT BE GOOD BUSINESS to know all the ways to save money with your Clark truck? It's the function of Clark attachments to transform your truck into a machine of *many* uses. Rather than let a truck stand idle for "lack of work," you can switch from one attachment to another in 10-20 minutes—go from one job to another, from partial idleness to *full-time* usefulness.



CARTON CLAMP

For example, why use manual labor to handle scrap, coal, sand or even cement? You'll do the job faster, more economically with one of Clark's shovel attachments. Why manhandle cartons, crates, rolls, drums, bales? Simply switch to the proper Clark attachment—there's one designed to handle practically any product or material. And for the relatively few cases where a standard attachment won't do the job, it's more than likely that our Custom Truck Department can design and build special equipment to solve the problem (—and inquiries are invited).



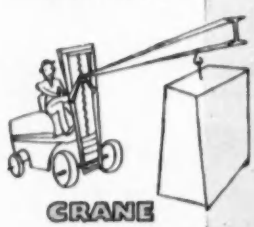
RAM

Perhaps you're hesitating to buy a fork truck because your principal handling job requires only part-time truck application. If that's the case, don't fail to look into this attachments angle. Chances are we've got, or can devise, one or more attachments that will enable you to utilize a fork truck profitably, all day long.

SHOVEL

Your local Clark dealer (listed in the Yellow Pages of your phone book) will be glad to help you plan ways to multiply the usefulness of your Clark trucks and POWRWORKER hand trucks. Or if you prefer to use the coupon, we'll gladly send a brochure describing the Clark line of attachments.

1903 1953 CLARK EQUIPMENT



CRANE

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS FORK TRUCKS AND POWERED HAND TRUCKS . INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 68, MICHIGAN

Please send: ☐ Attachments Catalog ☐ Driver Training Movie ☐ Have representative call

Name_____

Firm Name_____

Street_____

City_____ Zone_____ State_____

ROTATING ROLL CLAMP

More Defense Contract Awards

THIS latest list of defense prime contracts that have been awarded covers the period from June 26, 1953, to July 22, 1953. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, warplanes, automotive components and spare parts, automotive maintenance equipment, etc.

— A —

A. C. Spark Plug Div., Flint, Michigan
Vehicle Parts—8500—$76,245

Active Gear Company, Inc., Chicago, Illinois
Vehicle Parts—10,000—$51,500

Admiral Corp., Chicago, Illinois
Spare Parts—Various—$63,842

Airborne Accessories Corp., Hillside, N. J.
Maintenance Parts—Various—$32,114
Various Assemblies—Various—$222,684
Motor—349 ea.—$137,469
Maintenance Parts—Various—$70,633

Airesearch Mfg. Co., Div. Garrett Corp., Los Angeles, Calif.
Valve Assy.—367 ea.—$168,938
Spare Parts—Various—$381,991
Actuators, Thermostats & Shaft Assemblies—1 lot—$941,545
Thermostat—53 ea.—$29,652
Actuator—141 ea.

American Generator & Armature Co., Chicago, Illinois
Vehicle Parts—2800—$184,100

American Machine & Metals, U. S. Gauge Div., Sellersville, Pa.
Transmitter, Oil Pressure—1391 ea.—$113,118

Avco Mfg. Corp., Lycoming Spencer Div., Williamsport, Pa.
Spare Parts—$202,835

— B —

Bendix Aviation Corp., Bendix Products Div., South Bend, Ind.
Wheel Assemblies—198 ea.—$668,004
Brake Assemblies—198 ea.
Wheel Assemblies—99 ea.
Wheel Assembly—500 ea.—$37,345
Maintenance Parts—Various—$41,088
Fork: Bushing Assembly—683 ea.—$89,623
Maintenance Parts—Various—$46,677

Bendix Aviation Corp., Eclipse-Pioneer Div., Teterboro, N. J.
Indicators—Various—$31,617
Transmitter—649 ea.—$197,668
Indicator—529 ea.
6 ea.
Generators & Spare—2000 ea.—$1,206,575
Generator—6535 ea.—$293,540
1192 ea.
173 ea.
Indicator—91 ea.—$52,887
Type L-R Regulator—151 ea.—$54,654
15 ea.
66 ea.

(*Turn to page* 120, *please*)

WE MAKE AND FABRICATE...
STRONG, LOW-COST SPIRAL TUBING

Spiral Tubing, another outstanding C-D-F product, is an important new material for the progressive, cost conscious design engineer (and purchasing agent). It is a high strength plastic made from paper or fibre that is spirally wound, then impregnated with phenolic resin or insulating varnishes and carefully cured at high temperatures. The resulting tubes (round, square, rectangular or formed to special shapes) are stiff, sturdy, resistant to crush, with good tensile strength.

This unique product has good dielectric strength with low dielectric loss properties. Moisture resistance and dimensional stability is easily controlled in the manufacturing process. The wide variety of sizes, shapes, forms; the strength; low cost; ease of fabrication; speed of delivery; all combine to make C-D-F Spiral Tubing worthy of your investigation.

PRIMARY APPLICATIONS

COIL FORMS OF ANY SIZE OR SHAPE
- for tuned or untuned RF, IF, oscillator, and other coils used in radio, television, electronic circuits
- for solenoids, relays, circuit breakers
- for transformers
- for permeability tuners

INSULATORS
- for selenium rectifiers
- for electric motors
- relays

BUSHINGS OR SPACERS
- armature shaft spacers
- for mechanical support

SHIPPING PROTECTORS AND FOR SPECIALIZED PACKAGING

BOBBIN TUBES

BODIES FOR PAINT ROLL APPLICATORS

AS A COMBINATION MATERIAL
- with other C-D-F high strength plastics or electrical insulating materials

SIZES

The round tubing ranges from 3/32 to 8" ID, with wall thicknesses from .0075 to ¼". The minimum ID of square and rectangular tubing is ⅜", with 2⅛" the maximum ID. Wall thicknesses range from .010 to 3/32".

Standard lengths are from 2 to 4', with special sizes and grades, plain or impregnated, open for your discussion with our C-D-F sales and engineering staff.

FABRICATION

Spiral Tubing is readily sawed, punched, drilled, tapped, riveted, stamped, painted, depending on the grade; it is suitable for automatic machine operations, but not recommended for conventional machine threading. Waxing or varnish impregnation to improve moisture resistance is usually done on the finished coils by the user.

GRADE SELECTION

C-D-F has mass production facilities for both the manufacture and fabrication of eighteen distinct grades of Spiral Tubing. For example, there's a special punching grade, fine for punching rectangular or square holes near the end of the tube. A relatively soft tube is supplied for difficult stapling or riveting. C-D-F makes high strength automotive electrical bushings from a very hard tubing with high axial compressive strength. Combinations of kraft, chipboard, Diamond "fish paper" Insulation, and other materials are available.

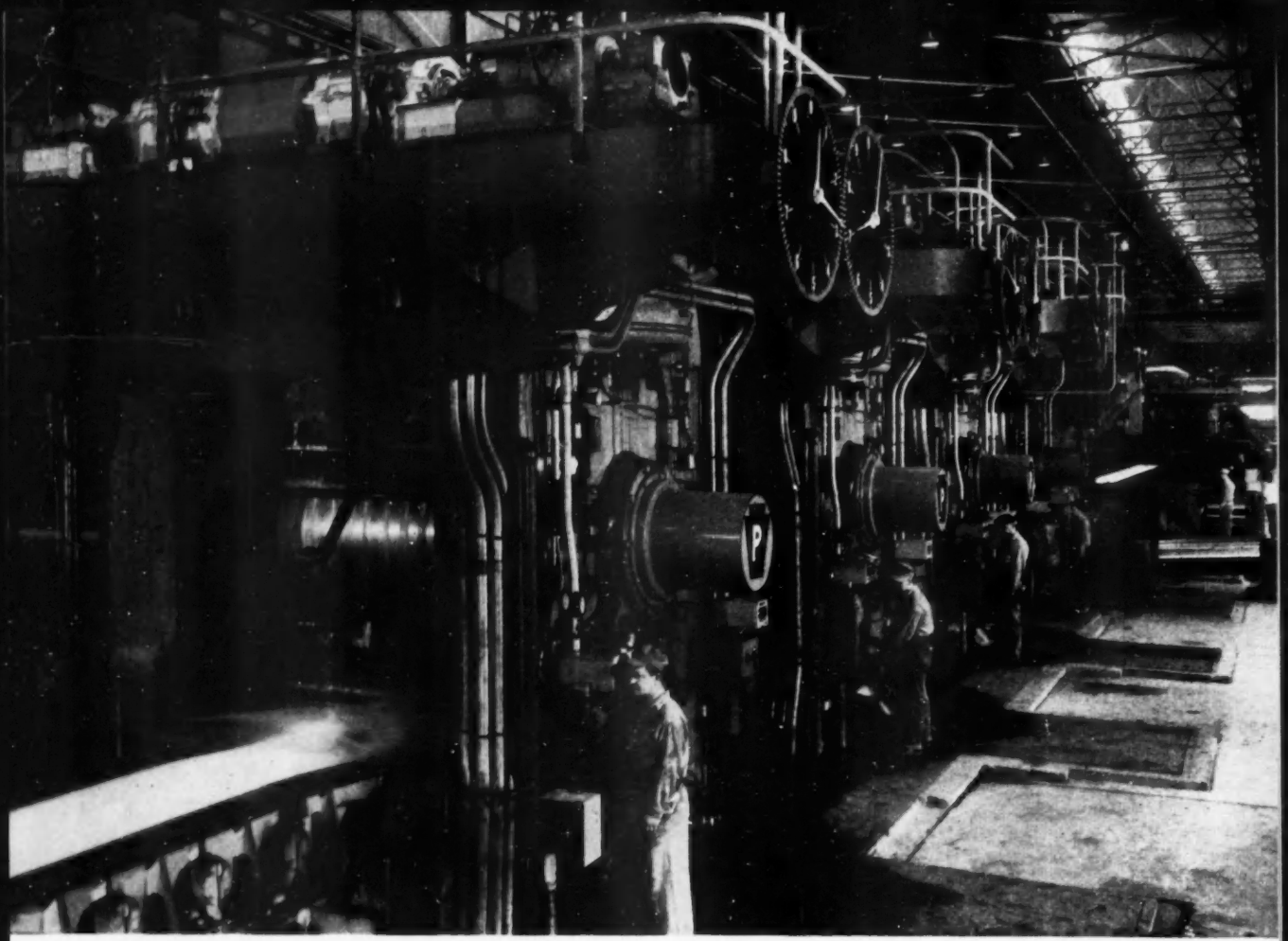
FORMS: ROUND • FORMED • FORMED AND NOTCHED • SQUARE AND RECTANGULAR

THE NAME TO REMEMBER FOR SPIRAL TUBING

Continental-Diamond Fibre Company

NEWARK 2, DELAWARE

Remember, C-D-F has production know-how, years of experience in electrical insulation. See your C-D-F sales engineer. Write now for new 1953 spiral tubing folder, a workbook showing grades, applications, properties.



The First Slab is the tough one to roll on a brand new rolling mill. That's why . . .

It Takes Experienced Heads and Steady Hands to Control a Mechanical Marvel

Pittsburgh Steel Company, long known for quality tubular and wire products, adds a new line—flat rolled steel—unveils new $28-million hot sheet mill with veteran hot-mill men at the controls.

Veteran Steelman, Avery "Ave" Adams, President of Pittsburgh Steel, watches a three-year dream come true as new mill "proves in."

Up Through the Ranks, P. E. "Pete" Sance, Vice President-Operations, and E. M. "Milt" Barber, Executive Vice President, nod approvingly as first slab speeds through rolls.

In less than 180 seconds this roaring, hissing, one-fifth of a mile long mechanical marvel squeezes, rolls, and coils a 15-ton slab of red hot steel into clean sheet steel fractions of an inch thick, 5 feet wide and over 1,000 feet long!

It's taken 27 years to build this mill because it combines all the tried and proven machinery and methods tested and adopted since the first mill of its kind was built in 1926. Actual construction took 20 months. The giant motors that drive the mill require enough electrical power daily to supply the domestic requirements for a city of 200,000; enough water (30 to 35 million gallons) to serve 300,000 people daily. The mill covers an area the size of seven football fields. Foundations took 42,280 cubic yards of concrete—enough to provide the

(Advertisement)

foundations for some 5,000 average size homes.

Yet, the high quality flat rolled steel sheets produced in this mill sell for about 5 cents per pound (about one-quarter of what you pay for a loaf of bread) to the various manufacturers who fabricate thousands of products essential to your daily living.

New Horizons—The shipment of first steel from this new 66-inch hot rolled sheet mill marks the entry of an old name into a new business. Pittsburgh Steel, with its long established reputation for quality steel, enters the sheet steel business—with sheets as free from surface defects and physical qualities as excellent as modern advances in science can produce.

Racing through the rolling train is sheet steel for your comfort, convenience and safety—steel for your automobile, for your electric and gas appliances, for construction machinery and building materials—for thousands of peacetime uses, and if need be, steel for the implements of war to protect you from aggressors.

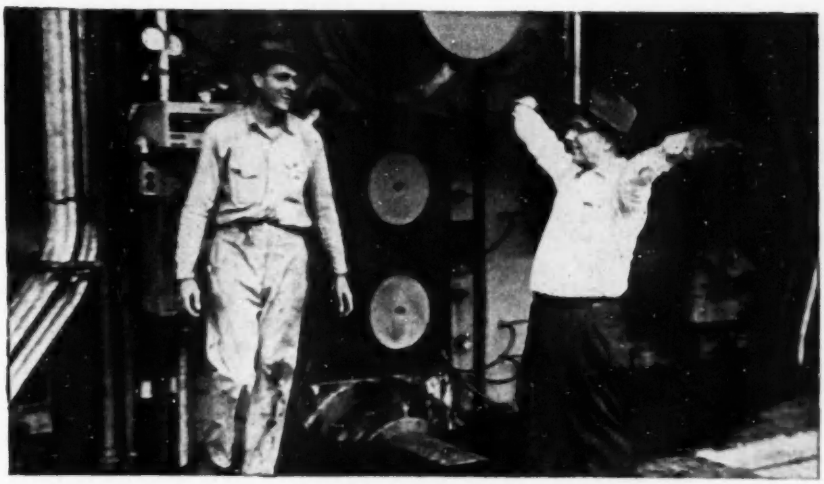
The opening of this new mill means Pittsburgh Steel is fast approaching two of its objectives in its Program of Progress: (1) *Balance* between its steel making capacity and its finishing facilities; (2) *Diversification* of its range of products.

The men who manage Pittsburgh Steel have worked hard to plan and build this mill, and put it into operation to serve you. They will see that your orders are filled as you want them, when you want them.

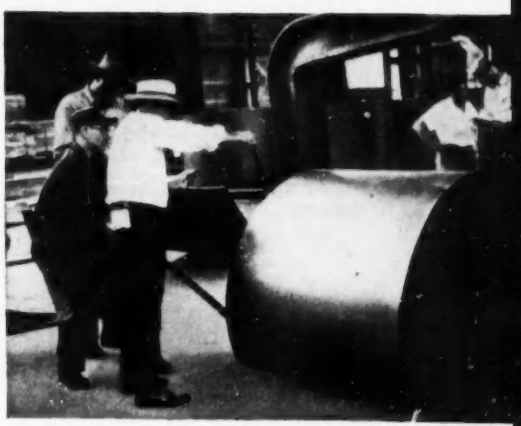
Coordinator, C. A. "Carl" Breuer, Assistant to Vice-President-Operations, sees new challenge as hot steel enters the smooth-running, reversing roughing stand.

"This Is It," grins J. E. "Joe" Simonin, Works Manager of the Allenport plant. In addition to the new sheet mill, he also has new seamless tube facilities under his wing.

"Let 'er Roll," barks W. H. "Bill" Webb, Sheet-Strip Superintendent, as first slab starts one-fifth of a mile journey.



"We're In," yells veteran Rolling Superintendent Harry Finik, waving arms as roller, Anthony "Tony" Thomas, turns from control stand after first sheet steel passes test run.



"Let's Give a Look," says Art Beglinger, Assistant Rolling Superintendent, 47 years a rolling boss. First steel from the mill showed good clean surface quality, excellent physicals—a top-quality product for commercial use.

Mill Builder, H. A. "Herb" Long, Chief Engineer, and J. H. "Joe" Carter, Board Chairman, watch intently as hot slab enters finishing train.

"Everything New But The Name"

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

Sales Offices in Principal Cities Throughout the Country

(Advertisement)

(*Continued from page* 116)

Maintenance Parts—Various—$59,462
Sero, Electric Type—30—$1,417,379
Pump Unit—120 ea.—$28,078
Pressure Indicator—531 ea.—$39,946
Pump Parts—Various—$441,792

Bendix Aviation Corp., Red Bank Div., Eatontown, N. J.
Inverter, rotary—478 ea.—$235,729
Inverter, rotary—191 ea.

Bendix Aviation Corp., Scintilla Magneto Div., Sidney, N. Y.
Ignition, Magneto—$29,381
Maintenance Parts—Various—$93,141

Biederman Motors Company, Cincinnati, Ohio
Vehicle Parts—2500—$42,400

Borg-Warner Corp., Pesco Products Div., Bedford, Ohio
Hydraulic Pump Assys.—200 ea.—$25,177
Motor Assemblies—598 ea.—$114,283

Bowen-McLaughlin-York, Inc., York, Pa.
Rebuild, Modify & Convert—336 ea. $3,832,795
Tank, M4A3/105MM How. to Tank Recovery Vehicle M74

The Bristol Company, Aircraft Equipment Div., Waterbury, Conn.
Controller—177 ea.—$93,954
Engine Temperature Controller—60 ea.—$31,774

D. P. Brown & Company, Inc., Detroit, Michigan
Commercial Vehicle—1000—$39,380

Burton Manufacturing Co., Los Angeles, California
Indicators—78 ea.—$26,910

Burton-Rodgers, Inc., Cincinnati, Ohio
Spare Parts—$89,048

— C —

Camfield Manufacturing Co., Grand Haven, Michigan
Hook for Bomb Rack—8003 ea.—$25,529

Canfield Tool & Die Co., Detroit, Mich.
Vehicle Parts—300—$76,800

Cannon Electric Company, Los Angeles, Calif.
Vehicle Parts—6800—$25,024

Carter Carburetor Corp., St. Louis, Missouri
Vehicle Parts—10,500—$49,989

Champion Spark Plug Co., Toledo, Ohio
Sleeve-Ceramic—190,000 ea.—$26,600

Cleveland Chain & Mfg. Co., Cleveland, Ohio
Tires—10,600—$51,473

The Cleveland Pneumatic Tool Co., Cleveland, Ohio
Drag Truss Assy.—28 ea.—$186,702

Collins Radio Co., Cedar Rapids, Iowa
Spare Parts—Various—$59,859

Continental Aviation & Engineering Corp., Detroit, Michigan
Maintenance Parts—Various—$222,836

Consolidated Car Heating Company, Albany, N. Y.
Vehicle Parts—900—$102,780

Continental Aviation & Engineering Corp., Detroit, Mich.
Parts—Various—$217,956

Continental Motor Corp., Detroit, Mich.
Tank Spare Parts—2800—$150,295

Cooper Tire & Rubber Co., Findlay, Ohio
Tires—1670—$146,035
Tires—23,300—$661,725

Curtiss-Wright Corp., Electronic Div., Carlstadt, N. J.
Spare Parts—Lot—$183,398

Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J.
Reconditioning—10,000—$1,792,700

— D —

Dana Corporation, Toledo, Ohio
Vehicle Parts—31,750—$34,788

Dorsey Trailers, Alba, Alabama
Vehicles—6—$40,210
Commercial vehicle—16—$121,291
Commercial vehicle—86—$189,470

Douglas Aircraft Co., Inc., El Segundo Div., El Segundo, Calif.
Panel Assembly Various—$29,028

— E —

Eicor, Inc., Chicago, Illinois
Inverter—1022 ea.—$82,569

— F —

Fargo Motor Corp., Detroit, Michigan
Commercial Vehicles—184—$724,243
Vehicle Parts—33—$42,031

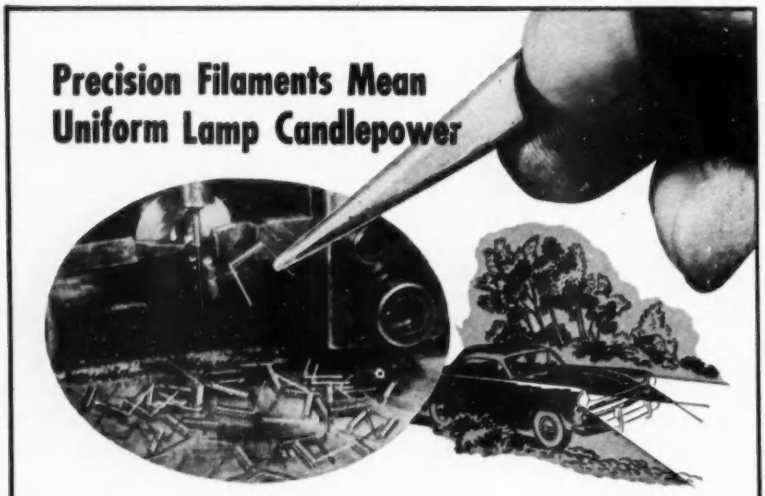
Firestone Tire & Rubber Co., Akron, Ohio
Vehicle Parts—16,000—$2,508,800

Flexible Tubing Corp., Guilford, Conn.
Vehicle Parts—5300—$28,249

Fontaine Truck Equipment Co., Inc., Birmingham, Alabama
Vehicles—56—$235,771
Commercial Vehicles—6—$34,020

Ford Motor Company, Washington, D. C.
Commercial Vehicle—19—$27,252
Vehicle Parts—24—$29,991

(*Turn to page* 122, *please*)



Precision Filaments Mean Uniform Lamp Candlepower

Safety on our highways after dark depends mainly on the illumination provided by the headlamps of cars, trucks and buses. One of the many critical operations in the making of lamps capable of delivering correct candlepower, is filament winding.

The picture shows tungsten wire filaments for Tung-Sol lamps being wound and shaped automatically to microscopic tolerances by high speed machines. This is the manufacturing tempo by which Tung-Sol supplies millions upon millions of lamps of every type to the automotive industry.

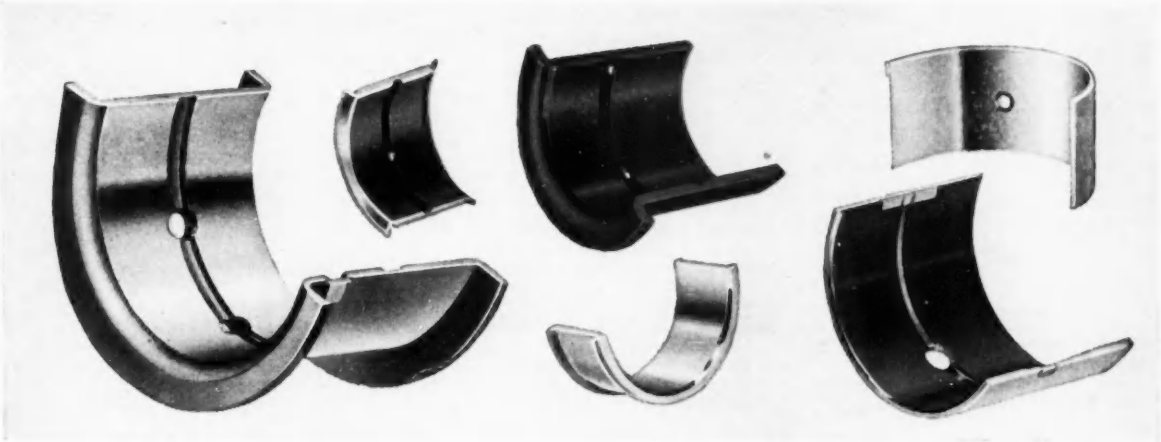
Although volume is essential, quality always comes first with Tung-Sol. Rigid production and quality control procedures hold Tung-Sol lamps to standards for uniform electrical and light characteristics that are unsurpassed in the industry.

Tung-Sol will gladly assist you with any miniature lamp application.

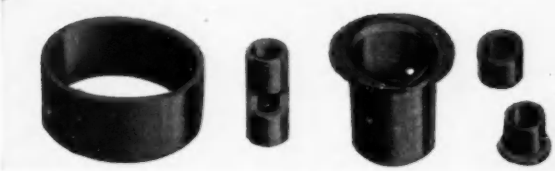
TUNG-SOL ELECTRIC INC., Newark 4, New Jersey
Sales Offices: Atlanta, Chicago, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Philadelphia, Seattle.

TUNG-SOL®
DEPENDABLE
AUTO LAMPS

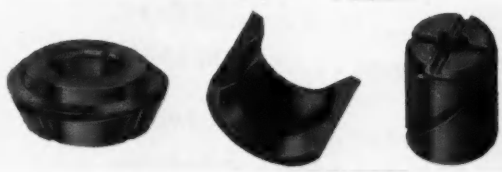
TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.



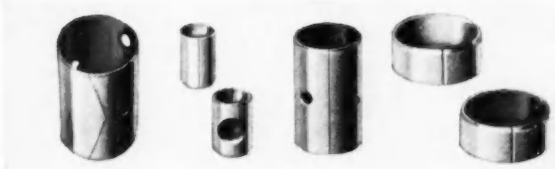
Sleeve bearings in a wide variety of designs and sizes



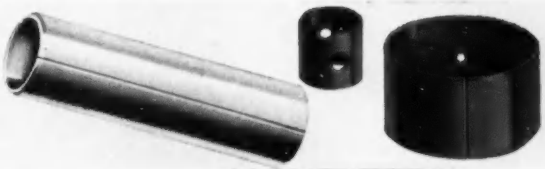
Cast bronze bushings



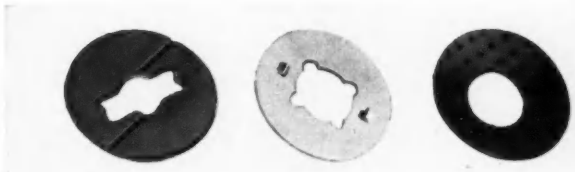
Precision bronze parts



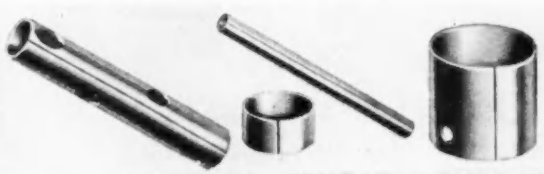
Bi-metal split bushings



Rolled split bushings



Washers



Spacer tubes

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quality control

FEDERAL-MOGUL CORPORATION FEDERAL Mogul **11037 Shoemaker, DETROIT 13, MICH.**

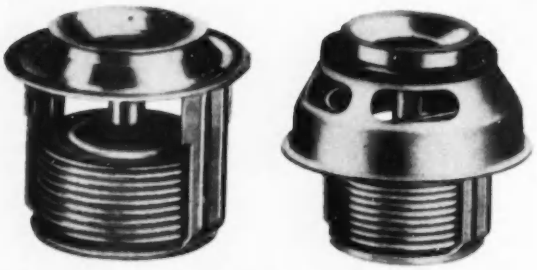
Since **FEDERAL-MOGUL** *1889*

(*Continued from page* 120)

Ford Motor Company, Dearborn, Mich.
FMGAA 6002 Engine—1500—$11,238,240
Ford Motor Co., Aircraft Engine Div., Chicago, Ill.
Spare Parts—$11,152,400
The Four Wheel Drive Auto Co., Clintonville, Wis.
Commercial Vehicle—645—$988,168
Fruehauf Trailer Company, Detroit, Michigan
Vehicle Parts—4800—$40,176

— G —

Gary Steel Products Corp., Norfolk, Va.
Commercial Vehicles—9—$62,610
General Armature & Manufacturing Co., Lock Haven, Pa.
Vehicle Parts—5000—$39,150
General Development Corp., Elkton, Maryland
Spares—Various—$111,830
General Electric Co., Schenectady, N. Y.
Generators—216 ea.—$205,336
21 ea.
191 ea.
Brush Assemblies—46,020 ea.—$50,668
Generators—$552,259
General Electric Co., Phila., Pa.
Spare Parts—Various—$42,992
General Motors Corp., Adel Div., Burbank, Calif.
Valves—Various—$43,118
General Motors Corp., Allison Div., Indianapolis, Ind.
Vehicle Parts—2400—$131,904
Spare Parts and Maintenance Tools—$3,031,602



FLEXON THERMOSTATS feature the only important Thermostat improvement in years

The Flexon Thermostat is a bellows type, precision built instrument designed with a new aid for proper heat control—the integral Stem Guide. The guide is accurately stamped as part of the top plate and provides precision centering and control of the stem. This means positive seating of the valve and true alignment for dependable performance. We will be pleased to discuss your requirements with you and show you how Flexon Thermostats can help you. Write, wire or phone, today.

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FORMERLY CHICAGO METAL HOSE CORPORATION
Flexon identifies CMH products that have served industry for over 50 years.
Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

GMC, Chevrolet Motor Div., Detroit, Michigan
Vehicle Parts—44,676—$68,098
Vehicle Parts—58,871—$28,225
Vehicle Parts— 241—$374,367
Vehicle Parts—15,509—$44,548
Vehicle Parts—42,706—$25,169
Commercial Vehicles—53—$86,411
GMC, Pontiac Motor Div., Pontiac, Mich.
40MM, M2A1 Dual Automatic Gun Concurrent Spare Parts—2894 (3 sets) $4,777,580
GMC, Truck & Coach Div., Pontiac, Michigan
Commercial Vehicles—32—$204,091
Vehicle Parts—26—$91,156
Vehicle Parts—35—$208,110
Vehicle—36—$74,268
Facilities for Mfg. of Power Plants for T-29 Tracked Vehicles—$216,046
Truck, Cargo 2½T—12,535—$76,375,678
Gibraltar Manufacturing Co., Detroit, Michigan
Vehicle Parts—4500—$121,275
Gilfillan Bros., Inc., Los Angeles, Calif.
Actuators—246 ea.—$125,320
Gladden Products Corp., Glendale, Calif.
Cylinder Assys.—Various—$31,137
The B. F. Goodrich Co., Akron, Ohio
Deicers—197 ea.—$111,552
85 ea.
115 ea.
Deicers—628 ea.—$249,772
Deicers—371 ea.
Deicers—622 ea.
The B. F. Goodrich Co., Dayton, Ohio
Wheel Assemblies—400 ea.—$1,434,728
Wheel Assembly—61 ea.—$33,885
73 ea.
73 ea.
Goodyear Aircraft Corp., Akron, Ohio
Spares—Various—$48,137
The Goodyear Tire & Rubber Co., Inc., Akron, Ohio
Brake Assy.—293 ea.—$64,460
Brake Assy.—260 ea.—$37,921
Wheel and Brake Assy.—456 ea.—$214,075
Wheel Assys.—634—$1,126,548
Brake Assys.—635 ea.
Wheel Assys.—598 ea.
Tires and Tubes—1800—$28,118
Wheel Assys.—138 ea.—$1,360,995
Wheel Assembly—500 ea.—$539,471
750 ea.
250 ea.
The Goodyear Tire & Rubber Co., Inc., Akron, Ohio
Wheel Assemblies—73 ea.—$421,456
Brake Assemblies—76 ea.
Brake Assy.—48 ea.—$51,665
Wheel Assy.—36 ea.
Brake Assy.—36 ea.
Brake Assy.—413 ea.—$185,431
Wheel Assy.—208 ea.
Brake Assy.—150 ea.
Wheel & brake Assy.—400 ea.—$80,530
Wheel & Brake Assy.—1500 ea
Wheel & Brake Assy—14,097 ea.
Gould-National Batteries, Inc., Depew, N. Y.
Aircraft Batteries—50 ea.—$63,066
146 ea.
16 ea.
Battery Aircraft—374 ea.—$63,823
Battery Aircraft—1009 ea.
Battery Aircraft—140 ea.
Grumman Aircraft Engineering Corp., Long Island, N. Y.
Maintenance Parts—Various—$155,807
Special Airframe—Various—$41,732
(*Turn to page* 126, *please*)

ONE OF A SERIES

You Get Many Benefits by Specifying VICKERS Hydraulics

Undivided Responsibility

From the time the surgeon grasps the scalpel until the last stitch closes the incision, he alone has complete responsibility for the success of the operation . . . and often the life of the patient. Because of the surgeon's specialized knowledge, no patient would think of having it otherwise.

Undivided responsibility is important in hydraulics, too. This is a significant benefit you derive from specifying Vickers Hydraulics. Since 1921, Vickers has accumulated a great store of specialized knowledge in hydraulics . . . and the line of equipment is so complete that Vickers is in position to take UNDIVIDED RESPONSIBILITY. There is no risk of incompatibility of equipment and Vickers Application Engineers know how to combine components for optimum operation.

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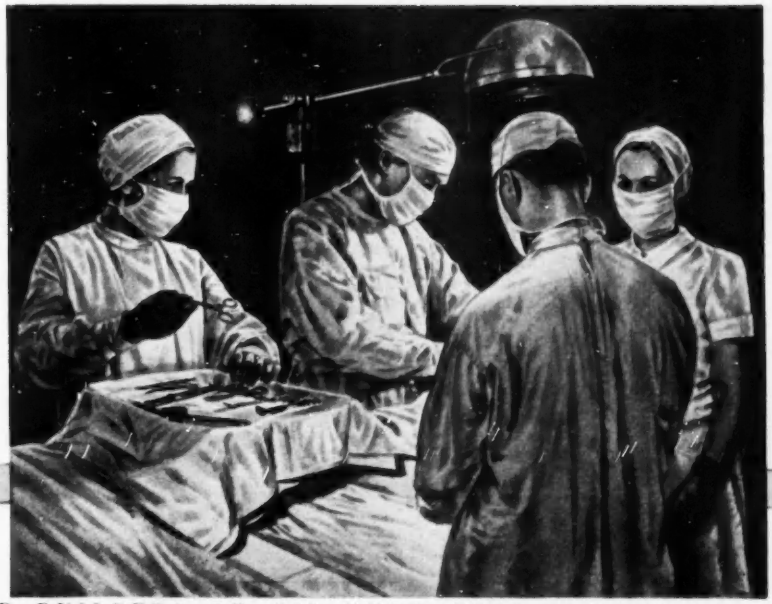
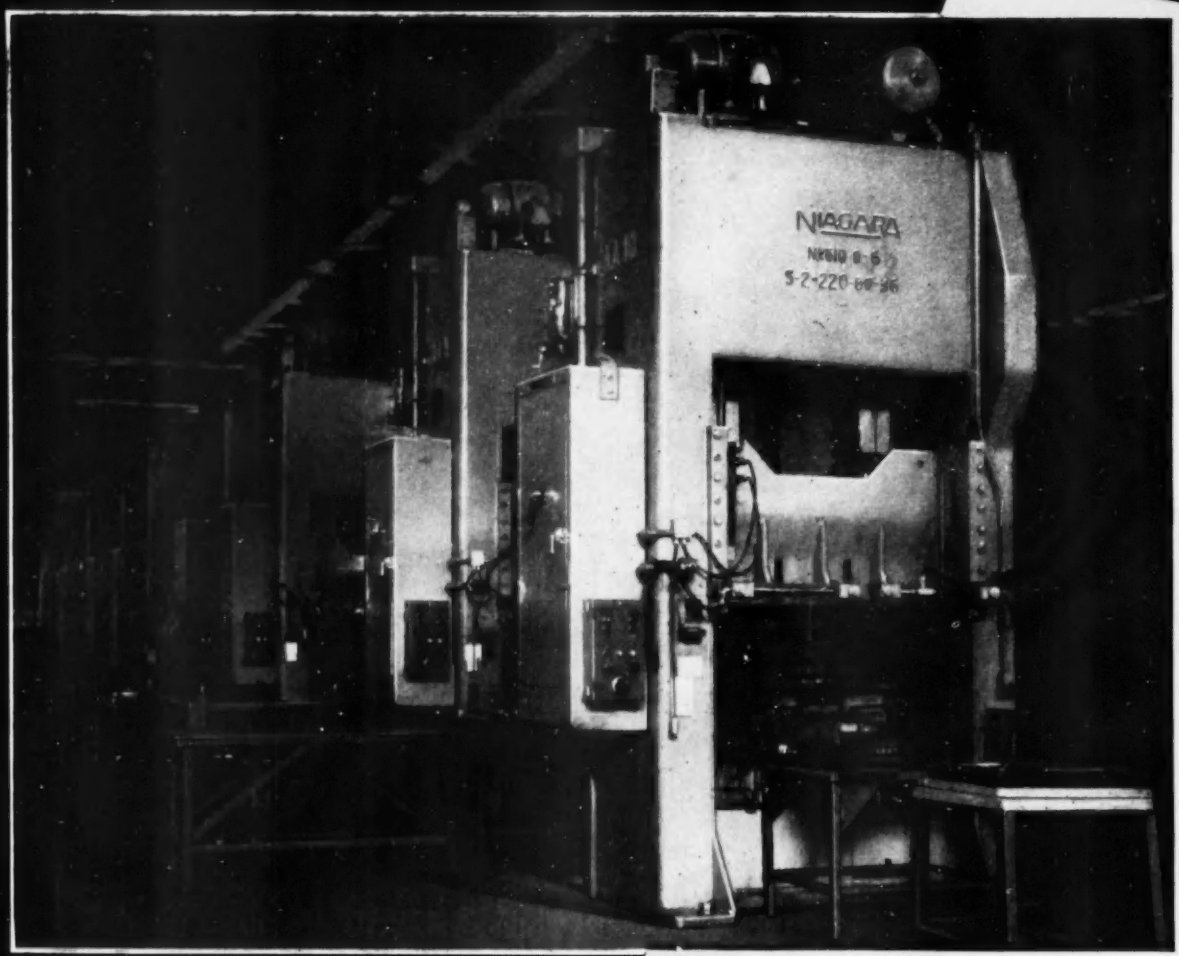


6392

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

NIAGARA



Typical production line of
Niagara Straight Side Double
Crank Presses in one of America's
foremost automotive plants

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

straight side double crank PRESSES

Speeding up Production in Large Automotive Plants

Niagara advanced engineering features and modern streamline styling combine to make these presses leaders in their field.

- Electrically welded steel construction
- Air actuated electrically controlled sleeve and friction clutches
- Anti-friction bearing mounting for high speed shafts, flywheel and clutch wheels
- Gearing enclosed and running in oil
- Neither gearing nor shafting overhang the working area to block light and be a potential danger
- Single and double geared
- Single or double end (twin) drive
- Adjustable air counterbalance for slide
- Pneumatic draw cushions with adjustable pressure and surge tank
- Wide range of sizes and capacities
- J. I. C. features if desired

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Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

THE ACTUAL IS LIMITED:
THE POSSIBLE IS IMMENSE
NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT
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Simplifies production of drive shafts . . . saves manpower with Automatic Lincolnweld

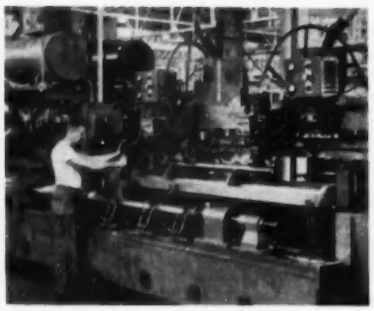


Fig. 1. Easy Operation. *Fittings are simply pressed over tubular shaft with hydraulic cylinder. Assembly is then transferred to welding station for "hidden-arc" welding in granular flux with "Automatic Lincolnweld" at speeds averaging 1-¼" in 10 seconds.*

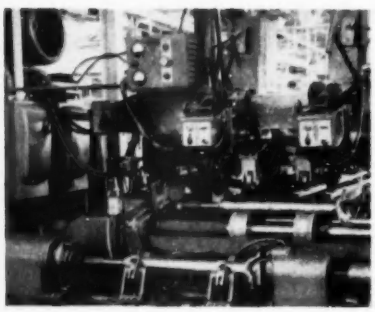


Fig. 2. Close-Up *shows "Automatic Lincolnweld" heads and controls. Work varies from 1-¼" to 4-½" diameter. Welding in granular flux eliminates arc rays. Each "Lincolnweld" unit is powered by 600 amp Lincoln "Shield-Arc" motor driven welding generator.*

HIGH welding speeds, smooth, dense and ductile welds prompt the broad use of automatic welding in granular flux. Substantial savings in time and costs make this automatic setup practical for many short run operations as well as high production runs since high welding speeds more than compensate for set up time and fixture expense.

In the production of drive shafts shown, both ends of the shaft are welded at one time. Shafts vary from 1-¼" to 4-½" diameter depending on customer requirements. Output is 50 to 90 driveshafts an hour.

CHECK THE POSSIBILITIES TODAY! Learn what new developments in faster, lower cost automatic welding are being developed at Lincoln to simplify, speed and cut the cost of your production. Write Dept. 2203. Complete information in bulletin 439.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

(Continued from page 122)

Maintenance Parts—Various—$26,138
3 Items of Stock Assys.—Various—$43,663

—H—

Hansen-Lynn Co., Inc., Burbank, Calif.
Quadrant Engine Control—54 ea.—$27,421
The Hartman Electric Manufacturing Co., Mansfield, Ohio
Relay—3213 ea.—$84,739
Heinemann Electric Co., Trenton, N. J.
Circuit Breaker—Various—$28,446
Hewlett Packard Co., Palo Alto, Calif.
Generator—Various—$40,447
Hobbs Mfg. Company, Fort Worth, Tex.
Commercial Vehicle—145—$164,830
Holley Carburetor Co., Detroit, Mich.
Parts—Various—$258,726
Services and Material—Various—$36,980
R. M. Hollingshead Corp., Camden, N. J.
Hydraulic fluid—58,464 gal.—$183,577
Hydraulic Research & Manufacturing Co., Burbank, Calif.
Valve Assy.—355 ea.—$30,213

—I—

Industrial Facilities Company, Pontiac, Michigan
Vehicle Parts—10,000—$29,300
Vehicle Parts—1515—$60,747
Ingersoll-Rand Co., Phila., Pa.
Air Compressor—72 ea.—$139,320
International Harvester Company, Washington, D. C.
Commercial Vehicle—271—$1,208,253
Commercial Vehicles—95—$465,269
Commercial Vehicles—14—$57,788
Vehicle Parts—12—$26,361
Commercial Vehicles—194—$880,808
Commercial Vehicle—30—$107,157
International Harvester Co., Detroit, Michigan
Vehicle Parts—120—$27,501
Interstate Engineering Corp., El Segundo, Calif.
Valve—303 ea.—$40,626

—J—

Jack & Heintz, Inc., Cleveland, Ohio
Generators—240 ea.—$206,449
2 ea.
24 ea.
Generators—510 ea.—$480,073
107 ea.
506 ea.
Panel, Control—1240 ea.—$774,597
274 ea.
1682 ea.
Generators—2480 ea.—$1,582,537
255 ea.
1195 ea.
Generators—670 ea.—$286,413
Generators—1738 ea.—$1,275,247

—K—

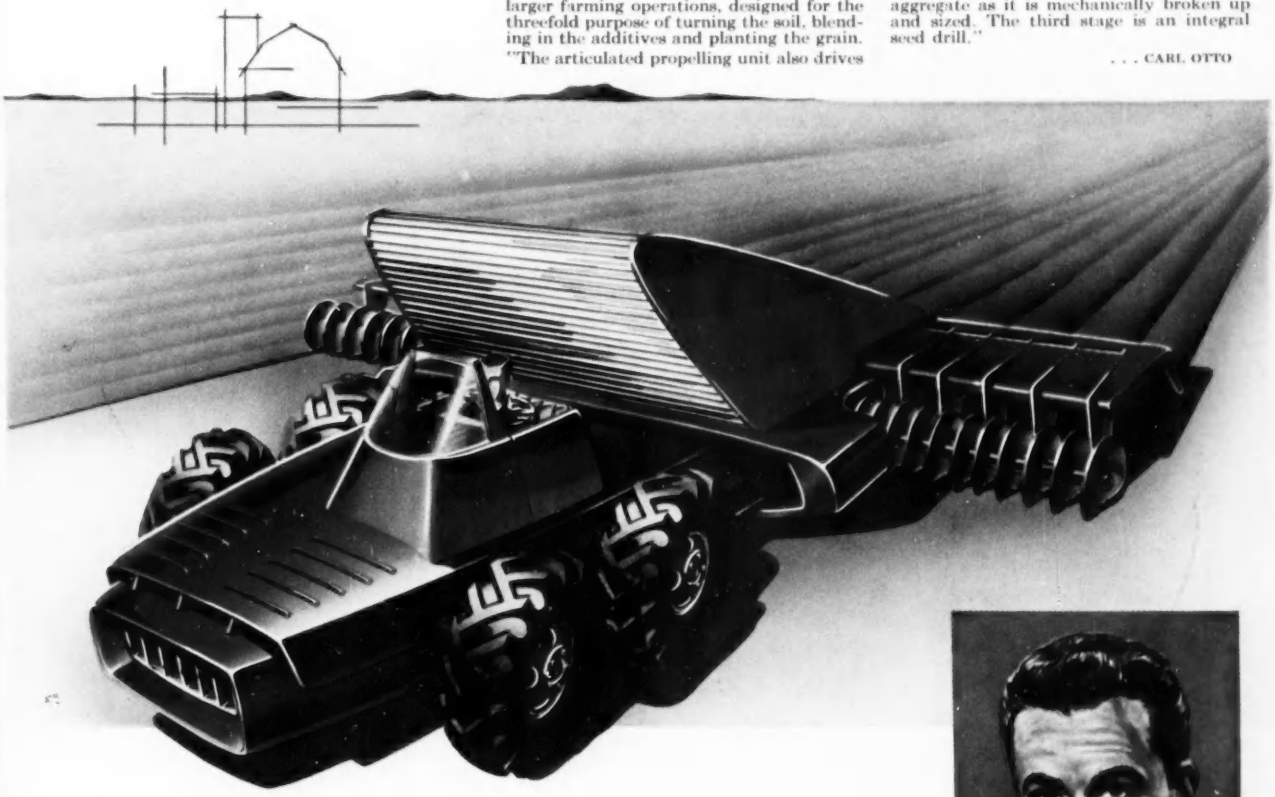
Dunbar Kapple, Inc., Geneva, Illinois
Tactical Vehicles—1828—$467,968
Kell-Strom Tool Co., Inc., Hartford, Conn.
Propeller Tools—Various—$38,108
Koehler Aircraft Products Co., Inc., Dayton, Ohio
Valve Assys.—Various—$26,783
Kollsman Instrument Corp., Elmhurst, L. I., N. Y.
Indicator—1101 ea.—$76,577
56 ea.
386 ea.

(Turn to page 129, please)

"Processing the soil with chemical additives and conditioners will ultimately revolutionize farming. We illustrate a diesel unit for larger farming operations, designed for the threefold purpose of turning the soil, blending in the additives and planting the grain.

"The articulated propelling unit also drives the high speed rotary discs or cutters, and the mixing stage which follows. Chemicals from the hopper are introduced into the aggregate as it is mechanically broken up and sized. The third stage is an integral seed drill."

. . . CARL OTTO



"Revive lagging markets, reach new buyers with robust color styling and functional design"

. . . says Carl Otto, New York Industrial Designer

"WHEN markets lag and buyers lose the impulse to buy, just plain good salesmanship would never be enough to keep America's industrial giant humming," says Carl Otto, New York Industrial Designer.

"Certainly we must sell, but we must also direct the full strength of our imaginations toward constantly restyling and improving the things we make to sell. In this we cannot rest nor relax.

"We must keep alive the impulse to buy . . . through a program of powerful design and color styling, and by building into our products greater benefits for the user! *This we must do with regularity and consistency!*"

KEEP ALIVE THE IMPULSE TO BUY YOUR PRODUCTS . . . with the help of a *planned* design and color styling program! Industrial designers and automotive or industrial color stylists are invited to make the most of color by availing themselves of the consulting services of the Rinshed-Mason color styling section. *Ask us for a study in color . . . applied to your product!*

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PAINTS • ENAMELS • LACQUERS • VARNISHES

R-M

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Above are shown two carbide metal rolls of identical composition. The one at the left cost the user about nine times as much as the one at the right. That differential was due solely to grinding vs. non-grinding. The plain face needed serrating, whereas the ready-toothed face needed nothing.

In many uses where tolerances are not too critical, CARMET blanks *preformed* to your specifications are ready for service without additional costly grinding. On jobs where finish grinding is necessary, the quality of Carmet's preforming holds grinding stock to a minimum.

Hundreds of special shapes can be preformed in Carmet. For practical suggestions that fit your needs, call or write your nearest A-L representative. ● *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 4048

AL
FINE TOOL STEELS
SINCE 1854

(*Continued from page* 126)

Indicator, True Airspeed—2623 ea.—$785,262
Airspeed Indicators—345 ea.—$31,829
Indicator: Tachometer—5377 ea.—$669,544

Kramer Machine & Engineering Prod. Co., Leavenworth, Kansas
Vehicle Parts—1390—$166,605

—L—

The Lackner Company, Cincinnati, Ohio
Airspeed Indicator—744 ea.—$36,251

La Crosse Trailer Corp., La Crosse, Wis.
Comercial Vehicles—18—$42,805

Laher Spring & Tire Corp., Oakland, Calif.
Vehicle Parts—7000—$39,200
Vehicle Parts—2000—$78,760

Lear, Incorporated, Grand Rapids, Mich.
Indicator—1162—$4,908,986
Control—1203 ea.
Flexible shafts—$174,206
Shaft, Jack Screws & Actuators—Various—$155,281
Screwjack—478—$64,040
Indicator—189—$1,154,539
Type K-4 control—189 ea.

Lear, Inc., Romec Div., Elyria, Ohio
Valve Assy.—275 ea.—$29,206

Lee Tire & Rubber Co., Conshohocken, Pa.
Tires—4200—$191,338

Link Aviation, Inc., Binghamton, N. Y.
Indicator—Various—$67,576

Liggett Spring & Axle Co., Monongahela, Pa.
Vehicle Parts—19,000—$164,370

Link Aviation, Inc., Binghamton N., Y.
Transformer—Various—$96,653

Lockheed Aircraft Corp., Burbank, Calif.
Repair—$110,000
Parts—Various—$30,687
Maintenance Parts—Various—$40,298
Maintenance Parts—Various—$36,668
Maintenance Parts—Various—$91,499

H. W. Loud Machine Works, Inc., Aircraft Service Corp., Glendale, Calif.
Hydraulic Cylinder—58 ea.—$39,579

—M—

M-D Parts Manufacturing Co., Los Angeles, Calif.
Vehicle Parts—15,000—$58,300

Mansfield Tire & Rubber Co., Mansfield, Ohio
Tires—1948—$181,906

Maremont Automotive Products, Inc., Chicago, Illinois
Vehicle Parts—15,150—$161,336

The Glenn L. Martin Co., Baltimore, Md.
Maintenance Parts—Various—$39,622

Master Vibrator Co., Dayton, Ohio
Trailer Mounted Generators—54 ea.—$119,556

The Mohawk Rubber Co., Akron, Ohio
Tires—1518—$27,161
Tires—2082—$209,906
Tires—5500—$1,111,902

Monroe Auto Equipment Company, Monroe, Michigan
Vehicle Parts—2700—$97,200

Motor Wheel Corp., Lansing, Michigan
Metal Parts for Shells—613,000—$821,420

—N—

Nasco, Incorporated, Cleveland, Ohio
Motor—1146 ea.—$49,651

The New York Air Brake Co., New York 17, N. Y.
Hydraulic Pump Assy.—Various—$1,046,927

Niles-Bement-Pond Co., Chandler Evens Div., W. Hartford, Conn.
Modify Carburetors—148 ea.—$200,028
Services & Material—2000 ea.—$53,240
Pump Assy.—600 ea.—$106,309

North American Aviation, Inc., Columbus Div., Columbus, Ohio
Spare Parts—Various—$207,315

Northwestern Auto Parts Company, Minneapolis, Minn.
Vehicle Parts—3700—$163,170

—O—

The Oliver Corporation, Charles City, Iowa
Vehicle Parts—600—$41,328

—P—

Pacific Piston Ring Co., Los Angeles, Calif.
Valve Assembly—1211 ea.—$29,560
25 ea.
25 ea.

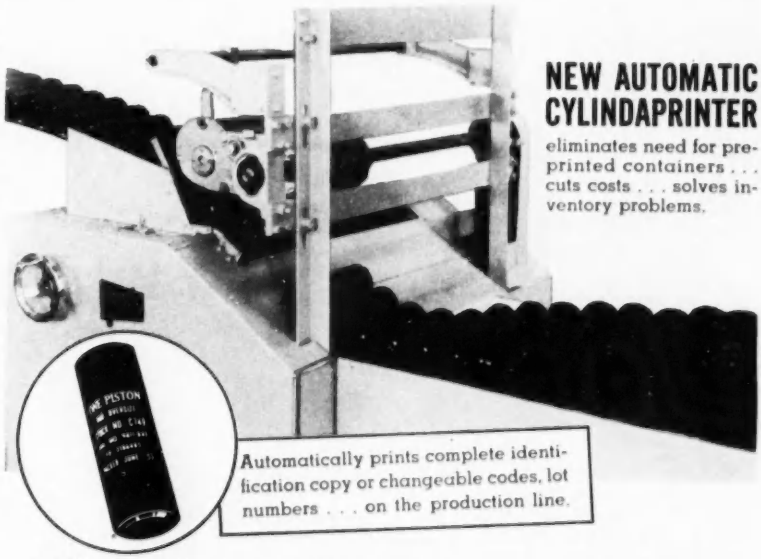
Pan-American World Airways System, Long Island, N. Y.
Blades—Various—$29,281

Parker Aircraft Co., Los Angeles, Calif.
Fuel Valve—340 ea.—$58,462
Valves—Various—$83,280

Premier Industries Corp., Monroe, Michigan
Vehicle Parts—27,000—$38,460

(*Turn to page* 130, *please*)

PRINT CANS—TUBES—CYLINDERS
as you need them...as you pack them



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eliminates need for pre-printed containers . . . cuts costs . . . solves inventory problems.

Automatically prints complete identification copy or changeable codes, lot numbers . . . on the production line.

- **May be fed automatically or manually . . . feeding need not be regularly spaced or timed**
- **Operates at variable speeds up to 80 units per minute**
- **Prints equally well on loaded or empty cylinders**
- **Adjusts quickly for cylinders of different diameters and lengths**
- **Copy changes made in minutes**
- **Makes sharp, permanent, "print-quality" impressions on smooth or rough surfaces . . . fibre, paper, metal, plastic, etc.**
- **Uses instant-drying inks of almost any color (including metallic) to meet government and civilian specifications**
- **Holds 8-hour supply of ink**
- **Designed for easy clean-up**

Write for details on the "AUTO-CYLINDAPRINTER" today

Gottscho

ADOLPH GOTTSCHO, INC.
Machines to Mark Whatever You Make
Hillside 5, N. J.

50TH YEAR

(*Continued from page* 129)

— R —

Reading Batteries, Inc., Reading, Pa.
Battery—860 ea.—$29,097
207 ea.

Red Jacket Manufacturing Co., Davenport, Iowa
Pump Assy.—100 ea.—$36,850

Reo Motors, Inc., Lansing, Michigan
Vehicle Parts—9000—$26,049

Republic Aviation Corp., Farmingdale, L. I., N. Y.
Special Tools—$238,400

Rogers Brothers Corp., Albion, Pa.
Vehicles—8—$35,152

Ross Gear & Tool Co., Lafayette, Ind.
Vehicle Parts—65—$36,938

— S —

Sargent Engineering Corp., Huntington Park, Calif.
Valve Assy.—115 ea.—$94,913

Schmitt Steel Company, Inc., Portland, Oregon
Vehicle Parts—27,000—$78,300

Schulz Tool & Manufacturing Co., San Gabriel, Calif.
Fuel Valve—Various—$208,398

Seeger Refrigerator Co., St. Paul, Minn.
Tank Assy.—5567 ea.—$6,465,179

Seiberling Rubber Co., Akron, Ohio
Tires—5200—$243,800

Simmonds Aerocessories, Inc., Tarrytown, N. Y.
Controls—36 ea.—$37,336
Indicators—Various—$79,801

Solar Aircraft Co., San Diego, Calif.
B-36 Shroud Assys.—1000 ea.—$40,106
Blanket Assy. Tailpipe Adapter—497 ea.—$394,241
Pipe Assy. Tail Exhaust—957 ea.

Sperry Gyroscope Co., Div. Sperry Corp., Great Neck, N. Y.
E-4 Autopilots—$6,039,490
Kits Used on Indicator — Various — $34,598

Superior Coach Corp., Lima, Ohio
Hardware—1354—$130,308

Superior Magneto Corporation, Long Island City, N. Y.
Vehicle Parts—11,000—$316,250

— T —

Transco Products, Inc., Los Angeles, Calif.
Relays—225 ea.—$41,771

Transmission Gear Sales Company, Chicago, Illinois
Vehicle Parts—19,500—$199,068

Tucker Sno-Cat Corp., Medford, Oregon
Model 743 Sno-Cat—2 ea.—$31,229

— U —

United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.
Spare Parts—Various—$51,666
Propeller & Governor Parts—Various —$228,395

United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Spare Parts—Various—$58,565
Spare Parts—Various—$134,179
Spares—Various—$272,928
Spare Parts—Various—$254,921
Spare Parts—Various—$69,712
Spare Parts—Various—$39,250
Spare Parts—Various—$128,114
Spare Parts—Various—$65,562
Spare Parts—526 ea.—$1,181,033
Spare Parts—Various—$63,452
Spare Parts—Various—$74,811
Spare Parts—3047 ea.—$64,078
Spare Parts—Various—$182,313
Spare Parts—Various—$1,532,588
Spare Parts—Various—$242,552
Spare Parts—Various—$304,030
Spare Parts—Various—$149,551
Material—24,820 ea.—$4,999,741
Spare Parts—Various—$86,768

United Aircraft Products, Inc., Dayton, Ohio
Services & Material—500 ea.—$67,815

United Motors Service Div., Detroit, Mich.
Vehicle Parts—5000—$100,870
Vehicle Parts—15,854—$43,673
Vehicle Parts—5400—$38,718

U. S. Electrical Motors, Inc., Los Angeles, Calif.
Motors and Spare—52 ea.—$30,969

— V —

Valve Division, Detroit, Mich.
Vehicle Parts—14,000—$134,680

— W —

Wagner Electric Corp., St. Louis, Missouri
Vehicle Parts—12,000—$89,928
Vehicle Parts—11,000—$39,853
Vehicle Parts—3500—$26,819

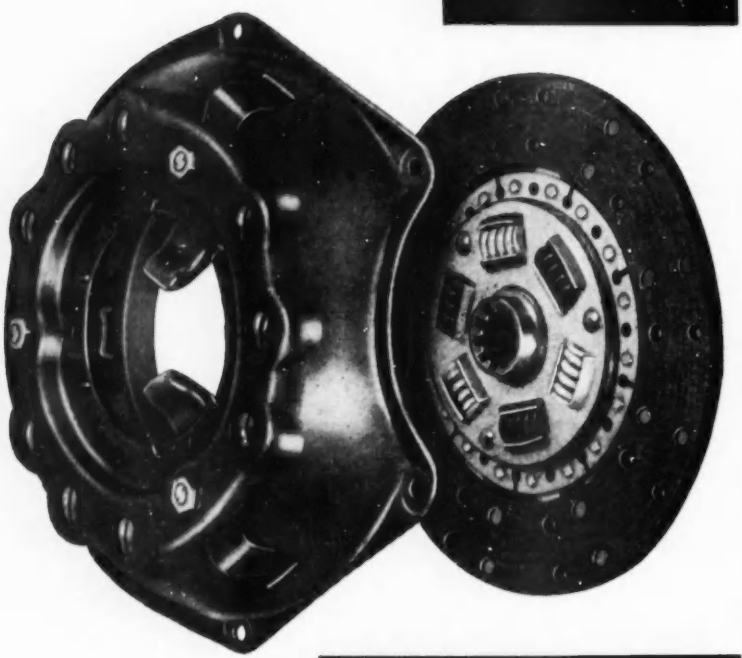
Weber Aircraft Corp., Burbank, Calif.
Seat Assys.—Various—$115,442

Western Gear Works, Lynwood, Calif.
Actuators—197 ea.—$95,018

Westinghouse Electric Corp., Dayton, Ohio
Generators—595 ea.—$502,981
537 ea.
Panels, Control—1500 ea.—$440,846
Racks, Mounting—900 ea.

(*Turn to page* 132, *please*)

Engineered by Borg & Beck... means MAXIMUM PERFORMANCE MINIMUM MAINTENANCE!



You can depend on BORG & BECK® CLUTCHES...FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD!

BORG & BECK CLUTCH THE STANDARD

Reg. U.S. Pat. Off.

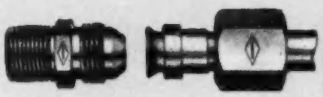
BW

BORG & BECK DIVISION • BORG-WARNER CORPORATION
Chicago 38, Illinois

Everything you need . . .

for HYDRAULIC TUBING CONNECTION WORK

IMPERIAL 37° *Steel* FLARED TUBE FITTINGS



3-PIECE TYPE has sleeve which reduces wrench torque required in tightening. Permits bends close to joint.

2-PIECE TYPE can be used for same applications as 3-piece type —offers advantages in economy.

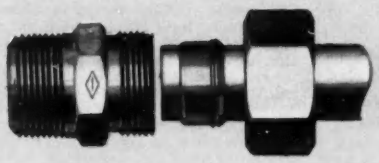
★ 2-Piece and 3-Piece Types. Withstand high pressure service and severe operating conditions.

★ Joints stay fluid-tight beyond burst pressure of the tubing. Meet J.I.C. requirements.

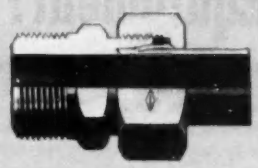
★ Used with J.I.C. and other soft steel tubing. Also copper, fully annealed stainless steel tubing, etc.

IMPERIAL *Steel* ERMETO TUBE FITTINGS

NO FLARING . . . NO THREADING . . . NO WELDING . . . NO SOLDERING



Fitting consists of 3 pieces: body, nut and sleeve.



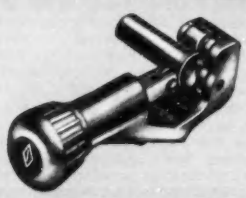
When assembled, sleeve bites into tubing assuring a tight joint.

★ Make safe connections that withstand high pressures and vibration. Joints stay fluid-tight beyond burst pressure of the tubing itself. Meet J.I.C. requirements.

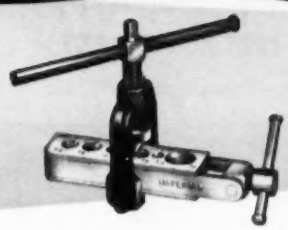
★ Easier and faster to install. Only an open wrench needed.

★ Can be used with practically any tubing, including heavy wall tubing that is difficult to flare.

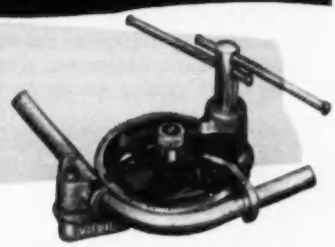
IMPERIAL TOOLS . . . *do jobs better—faster*



HI-DUTY TUBE CUTTER. Has ball bearing action, flare cut-off groove in rollers. Retractable reamer. **No. 274-F** for 1/8" to 1" O.D. Tubing. **No. 312-F** for 1/4" to 1-3/8" O.D. **No. 206-F** for 3/4" to 2-1/4" O.D. Also **No. 384-F** Sawing Vise for tubing 3/16" to 1-1/2" O.D.



37° FLARING TOOLS for SAE 1010 soft steel and other metal tubing. Make flares to J.I.C. standards. Easy, single lever clamping. One compact tool, **No. 437-F,** flares six sizes — 3/16", 1/4", 5/16", 3/8", 1/2", 5/8" O.D. Tubing. **No. 537-F** flares 3/4", 7/8", 1", 1-1/4" O.D. Tubing.



UNIVERSAL GEAR-TYPE BENDERS. Will bend any type of tubing, including hard temper, heavy wall steel. Also pipe. High gear ratio makes bending easier. **No. 270-F.** Individual Benders for each size of tubing — 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/8" O.D. Also lever-type benders.

THE IMPERIAL BRASS MFG. CO., 1241 W. Harrison St., Chicago 7, Illinois
In Canada: 334 Lauder Ave., Toronto, Ontario

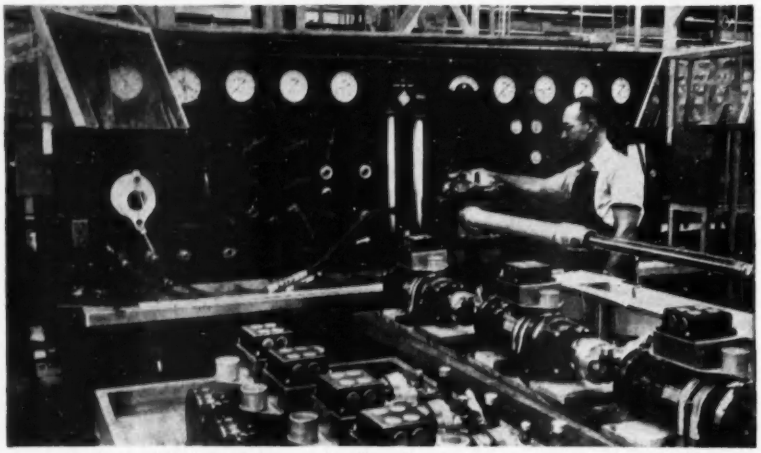
Ask for Bulletin Set HC.

IMPERIAL

Pioneers in Tube Fittings and Tubing Tools

GREER TOPICS

Important News of Aviation & Industrial Test Equipment



Greer Stationary Hydraulic Accessories Test Stand, shown here at Lockheed's Georgia plant, provides a shop-type machine to fully check the performance of hydraulic system accessories including system pump at flow rates to 20gpm, pressures to 3400psi.

Why Does Lockheed Aircraft Test with Greer Equipment?

Why does almost any aircraft builder you can name test with Greer?

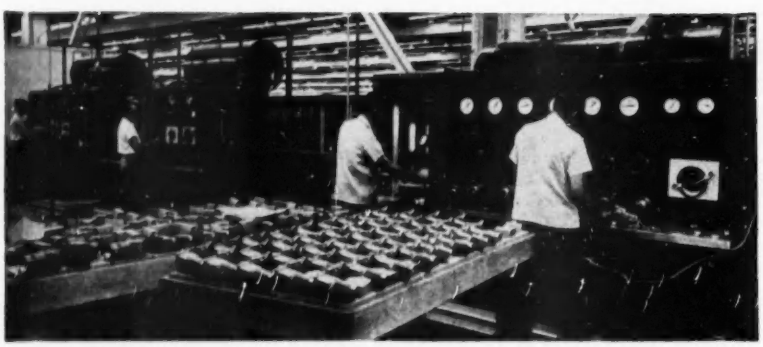
Because the entire industry knows it can *depend* on Greer. It's as simple as that. That's why Lockheed Aircraft Company, famous builders of the Constellations and many military aircraft, choose Greer Test Equipment.

Greer points to an unequalled record for service to the aircraft industry. A reputation that guarantees complete satisfac.ion. A list of customers that reads like a "Who's Who" of aviation.

Pioneers in test equipment, Greer has more recently aroused industry-wide interest by furthering the standardization of test equipment. A study of the Greer catalog (write on your letterhead for free copy) will reveal a remarkable selection of standard units for a great variety of test jobs.

For out-of-ordinary requirements, call or write Greer's engineering department. Men with experience you could never match are waiting to go to work on your problem.

GREER
TEST EQUIPMENT



Greer Dual Fuel Booster Pump Test Stands, shown on left, provide test components for checking run-in and performance on two fuel pumps simultaneously with flows up to 60,000pph and pressures to 100psi. Greer Fuel Pump and Accessories Test Stand, on right, checks all fuel components with flows to 300gpm and pressures to 800psi.

Greer Hydraulics Inc. 454 Eighteenth Street, Brooklyn 15, New York

Field Offices: 1908 West Cermak Road, Chicago, Illinois • 25 South Main Street, Dayton, Ohio 2832 East Grand Boulevard, Detroit, Michigan • and sales representatives in all principal cities

(*Continued from page* 130)

Generators—227 ea.—$140,123
645 ea.
2805 ea.
Generators—1330 ea
135 ea.
900 ea.
Technical Changes—$198,299
Spares—$342,026

Westinghouse Electric Corp., Philadelphia, Pa.
Relays—205 ea.—$41,418

Weston Electrical Instrument Corp., Philadelphia, Pa.
Indicator: Thermometer — 896 ea. — $43,602
Ammeter—Various—$29,011

White-Rodgers Electric Co., St. Louis, Missouri
Servos—Various—$49,927

Witbeck Aircraft Corp., Gainesville, Texas
C-47 Aircraft—3 ea.—$300,000

BOOKS . . .

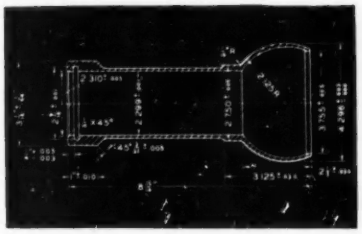
STANDARDS—ENGINEERING TOOLS FOR INDUSTRY, *published by American Standards Association, 70 E. 45th St., New York 17, N. Y. Price, $2.00.* Proceedings of the Third National Standardization Conference, held in conjunction with the Centennial of Engineering in Chicago last September, have been published in this book. Combined with the proceedings are the principal addresses presented at the Association's 34th Annual Meeting Award Luncheon, held November 25, 1952, in New York. The booklet also includes papers featuring standardization experience and practices in industrial construction and home building, chemicals, safety, purchasing, photography, welding, and the international field.

GAS TURBINE ANALYSIS AND PRACTICE, *by Burgess H. Jennings and Willard L. Rogers, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $8.50.* This book offers a general and comprehensive picture of the operational points, the place and extent of use in industry, and the probable future development of the gas turbine. After development of a sound background of engineering fundamentals, the book applies these to specific components of the gas turbine power plant. Attention is here devoted to stresses and materials of construction, in addition to the thermodynamic aspects of design. The text includes example problems with solutions for clarification of the use of the concepts and applications under discussion, as well as problems for reader solution. Numerous types of gas turbine units are discussed and illustrated in detail not only in relation to aircraft propulsion, but also in connection with the gas turbine as a power unit.

MEASUREMENT TECHNIQUES IN MECHANICAL ENGINEERING, *by R. J. Sweeney, published by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. Price, $5.50.* Here is a ready source of information on the common measurement techn'ques used in the performance testing of power equipment—engines, pumps, compressors, and combustion and heat transfer apparatus. The discussion of instruments covers their primary function of measurement and indication, and their function as signalling devices to automatic controllers. In presenting methods for high-accuracy measurements referred to calibration from fundamental standards, the author covers the most effective techniques and analyzes their on-the-job practicality.

Gift Wrapped—

A Customer's Job-Proved View of the Mona-Matic



BALL HOUSING (left): Fabricated steel. Turn ball and opposite end diameter; bore and form internal groove. Limits ±.001". Replacing battery of 4 machines, Mona-Matic raised production from 150 to 260 parts per day. **SLEEVE** (right): Steel. Bore and internal chamfer both ends. Production increased from 20 to 70 parts per hour.

Gift? Here are the facts, the job and the results. You decide what you'd think, if it were your job!

The National Machine Works, Oklahoma City, produces a fine drive shaft housing repair kit, consisting of a steel sleeve and ball housing (see details, left). Previously, 4 machines—4 operators—were required.

Now, thanks to the Mona-Matic's built-in gift for boosting output (plus savings on setup, form tools, tool change and grinding) this happy user is not only handling production with *one* machine, but has also materially increased production. If that doesn't strike you as a gift, consider this fact—this Mona-Matic, not even operating full time, has *paid for itself in less than one year!*

The Monarch Mona-Matic, briefly, is a fully automatic cycle, high-speed, Air-Gage Tracer controlled, single running tool turning machine —easily set up, extremely accurate, with infinite feed range and integrated rear carriage. It is furnished in a variety of versions, all proved in both long and short runs.

We've prepared Booklet #1805 giving the full story of the Mona-Matic—complete with data, specifications and many other job reports. Even if you don't believe in gifts, there's no time like the present! Write now . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

ON OUR WASHINGTON WIRE

Demand for passenger automobiles is to remain strong throughout the next 12 months, due, in part to the consumer's belief that the market for buyers is favorable and will remain so, says the latest Federal Reserve Board consumer market study.

Creation of a motor vehicle division within the Commerce Dept. is virtually assured. Industry officials will rotate as its head, while advisory committees will continue much the same as under NPA. The AMA is to act and speak for the industry on most matters between committee meetings.

A growing trend toward shipment of steel and steel products by motor carrier may be slowed down, since the Senate shelved a bill to curb ICC trip-leasing authority. An Interstate Commerce Commission order which bans leasing of trucks for periods of less than 30 days will go into effect as of Sept. 1.

Congressional committees looking into the current clamor for industry-wide adoption of guaranteed-wage schemes are noncommital about taking any official position on the pros and cons of such wage set-ups. They are unofficially agreed on the merits on gaining industrial peace via the bargaining table rather than by Washington edict.

The AMA has asked Congress to adopt a ten-year road modernization program. James Cope, Chrysler's v-p in charge of public relations, presented the proposal to a House Committee on the federal-aid road program.

Reduction in emphasis on government research activities was further indicated by CAA's opposition to loans for jet transport development, before a House Commerce subcommittee considering such a bill.

Sagging tax collections, plus reduced activity in new and used machinery markets, is said to be spurring prompter consideration of Treasury Secretary Humphry's long-range program for lowering depreciation rates. He may be in sympathy with industry's proposals for write-offs in ten years, or even less. Re-writing of Federal depreciation rules by Congress was set for sometime next year, but Mr. Humphry could revise existing amortization rules in the absence of new legislation.

Manufacturers of...

HARDENED and GROUND PARTS

for over 40 years

SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

Henry W. Brown

PRESIDENT

KING PIN

Parts include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.

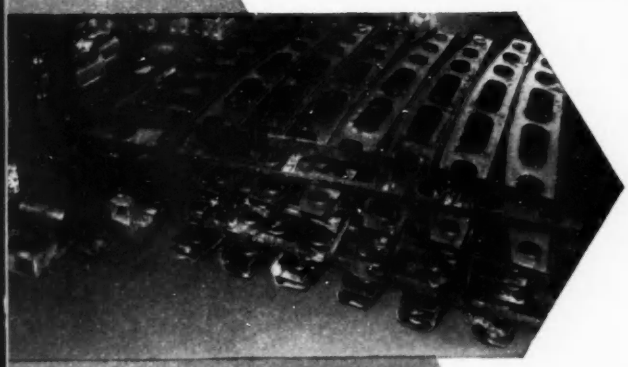
213 BELLEVUE AVE. SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5609 N. Clark St., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Johns William & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 5611 S.E. Yamhill St., Portland, Ore.

Clearing 3,500 ton mechanical press used to produce beam supports for French railway cars.

Remember those 40 or 8's?

Now Clearing Presses Help Make Them



Railway car beams or longerons mass produced on a Clearing press.

French railway cars, marked *40 hommes ou 8 chevaux* in the days of World War I, have undergone a big change. Now, the supporting beams that run the length of the car are stamped out on a 3,500 ton Clearing press.

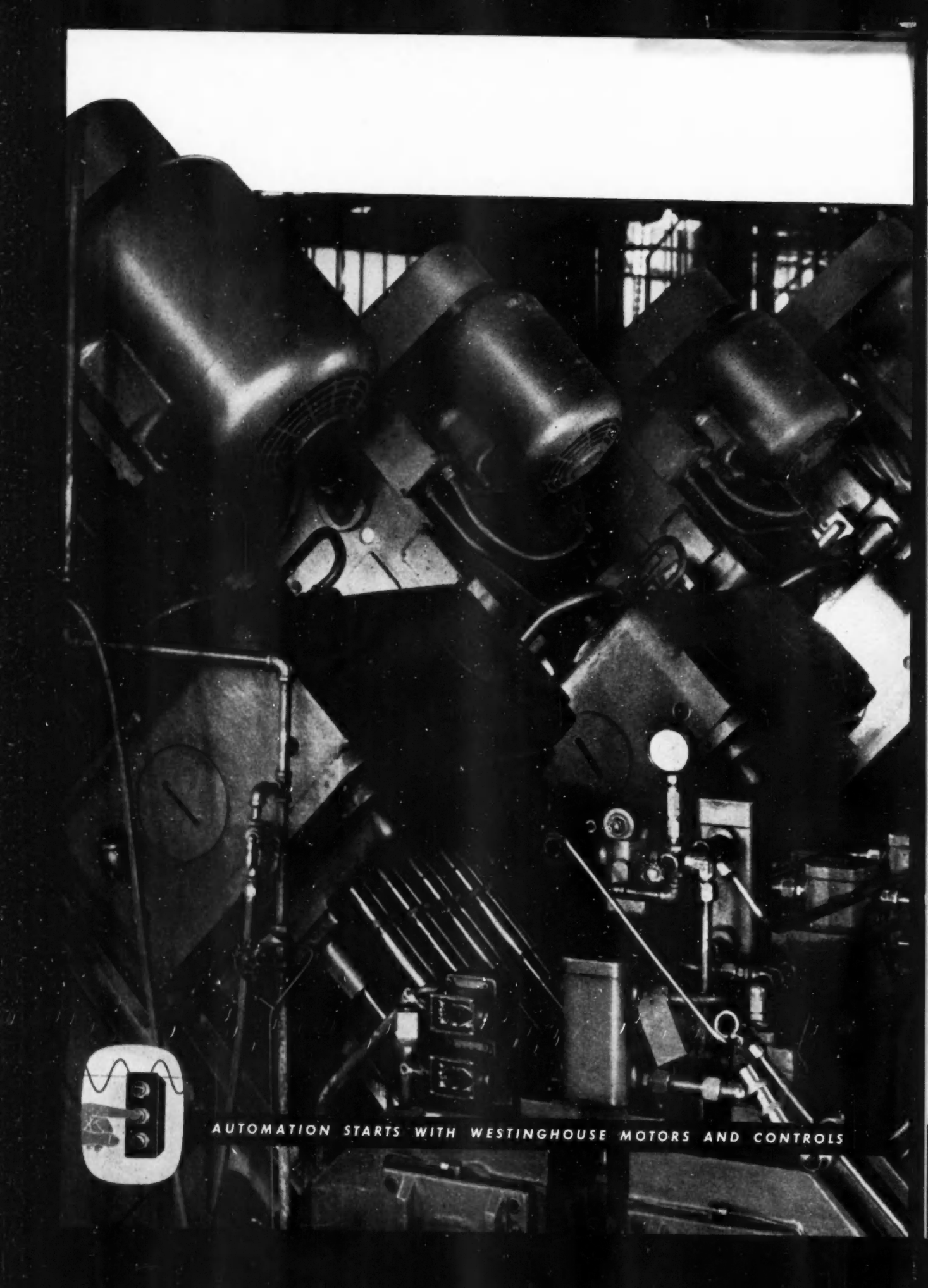
The Etablissements Arbel in Paris has been successfully producing these 27 foot beams, or *longerons*, for several years. Landing mats, side plates for large reels and structural steel work are some of the other products turned out at Arbel on their big Clearing.

Whether you make parts for railroad cars or kitchenware, Clearing engineers can provide you with the equipment to do the job at maximum efficiency. Call or write Clearing Machine Corp. today.

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION, 6499 West 65th St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio


AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS

How to keep a production line humming at peak capacity

You can't hear the steady hum, but if you could, you would say, "There's a well-built production line." The line just keeps on running, keeps on machining. It wasn't always that way, but it has been ever since Westinghouse Motors and Controls were installed back in 1950.

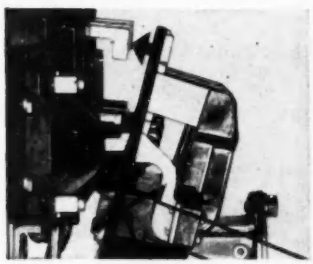
You see, when you standardize on Westinghouse Life-Line* Motors and Controls, you're installing the kind of horsepower that really increases output per man. For example, there's no down time for motor lubrication. Life-Line motors are pre-lubricated and sealed for life at the factory. Also, you don't need to worry about starters sticking. Life-Line Starters have an advanced clapper design that depends on a positive spring action instead of gravity. They can't stick or jam.

*Trade Mark

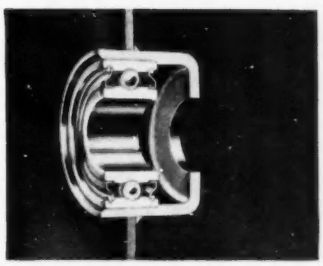
Remember, too, that Life-Line Starters give you permanent overload protection. A bimetallic snap-action, disc-type overload relay provides foolproof operation. It never loses its accurate factory calibration. And special insulation gives Life-Line motors maximum dielectric strength . . . enables them to resist moisture and mild chemicals.

Get these free moneysaving facts

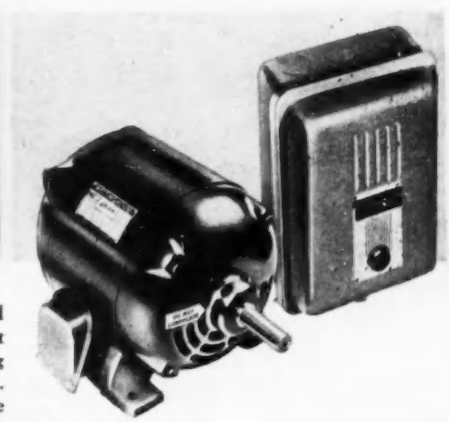
101 Life-Line Case Histories, B-4769, tells how 101 other manufacturers have used Life-Line motors to keep production humming at peak capacity. After you read how, see how from the movie, *Life-Line Speaks for Itself.* Phone your Westinghouse representative for this vital information, or write to: Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-21753



Here is a closing arrangement with fewer moving parts. The entire contact assembly pivots on a knife-edge of hardened steel. There are no sliding surfaces to bind or wear . . . no misalignment troubles. Jamming and sticking are eliminated. Nothing need be lubricated.



Westinghouse Pre-lubricated Bearings have the proper lubricant sealed in at the factory. Greasing schedules can be forgotten. Special seals guard against the entrance of harmful dust and dirt which ordinarily spell wear and possible bearing burnout.



YOU CAN BE SURE . . . IF IT'S

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CLEVELAND
PLUGS SLEEVES CAPS
PROTECT PARTS!

AVOID DAMAGE to threads from dust and dirt . . . in transit . . . while dipping or spraying.

Use our PLUGS for internal threads . . . SLEEVES and CAPS for external threads.

We design and produce them to meet the most exacting needs.

Our Plugs and Sleeves obtainable in diameters from ⅛ inch up. Caps from ¼ inch up.

Special Sizes and Shapes to meet YOUR needs.

★ ★ ★

Also available . . . Chemically Treated Plugs with added strength and stiffness . . . with proper resilience to ensure a clean, tight, dust-proof fit.

Grease proof . . . low moisture absorption . . . non-inflammable . . . and are stable up to 260° Fahrenheit.

★ ★ ★

Attractive Prices! Quick Deliveries! Consult us on your needs!

The CLEVELAND CONTAINER Co.
6201 BARBERTON AVE. CLEVELAND 2, OHIO
• All-Fibre Cans • Combination Metal and Paper Cans
• Spirally Wound Tubes and Cores for all Purposes
PLANTS AND SALES OFFICES: Cleveland, Detroit, Chicago, Plymouth, Wisc., Jamesburg, N. J., Ogdensburg, N. Y. • ABRASIVE DIVISION at Cleveland
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Cleveland Container Canada, Ltd., Prescott, Ontario • Offices in Toronto and Montreal

CALENDAR

OF COMING SHOWS AND MEETINGS

SAE International West Coast Meeting, Georgia Hotel, Vancouver, B. C. .....Aug. 17-19

Western Electronic Show & Convention, Civic Auditorium, San Francisco, Calif. .....Aug. 19-21

Third Annual European Machine Tool Exposition, Brussels, Belgium .....Sept. 4-13

National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O..Sept. 5-7

Society of British Aircraft Constructors' Display, Farnborough .....Sept. 7-13

SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. Sept. 14-17

Truck Body & Equipment Ass'n annual meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio....Sept. 21-23

Eighth National Instrument Conference and Exhibit, Chicago, Ill. .....Sept. 21-25

SAE National Aeronautic Meeting, Hotel Statler, Los Angeles, Calif. Sept. 29-Oct. 3

American Inst. of Electrical Engineers Aircraft Technical Conference, Benj. Franklin Hotel, Seattle, Wash.....Sept. 30-Oct. 2

Paris Salon, France .....Oct. 1-11

38th International Motor Show, Earls Court, London .....Oct. 21-31

American Gear Manufacturers Association Semi-Annual Meeting, Edgewater Beach Hotel, Chicago, Ill. .....Oct. 25-28

SAE International Production Meeting, Royal York Hotel, Toronto, Canada .....Oct. 29-30

American Society of Tool Engineers, semi-annual membership and board meeting, Dayton Biltmore Hotel, Dayton, O. .....Oct. 30-31

SAE National Transportation Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 2-4

SAE National Diesel Engine Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 3-4

Third Transport Aircraft Hydraulic Conference, Park Shelton, Detroit, Mich. .....Nov. 3-4

SAE National Fuels and Lubricants Meeting, Conrad Hilton Hotel Chicago, Ill. .....Nov. 4-6

Montreal Materials Handling, Tool and Industrial Equipment Shows, Show Mart, Montreal, Que. .....Nov. 9-13

American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York, N. Y. Nov. 29-Dec. 4

1954

SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich. .....Jan. 11-15

National Motor Boat Show, Bronx, N. Y. .....Jan. 15-23

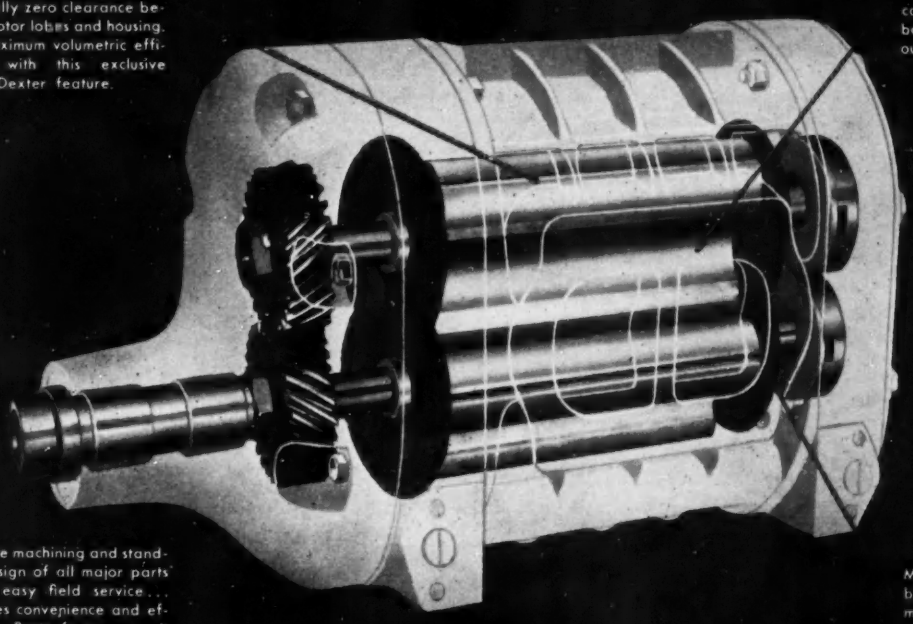
National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y.....Feb. 17-19

SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....March 2-4

only MIEHLE-DEXTER superchargers give you these 4 big engineering advantages

Formica wear strips are locked into rotor lobes... provide practically zero clearance between rotor lobes and housing. Get maximum volumetric efficiency with this exclusive Miehle-Dexter feature.

Here's a big plus... lightweight aluminum rotors and case. Little wonder up to 50% bonus power is available without penalty of added weight.



Accurate machining and standard design of all major parts allows easy field service... improves convenience and efficiency. Parts from one unit can be field-installed in another of the same type.

Miehle-Dexter's patented rubber grid seal, vulcanized to metal end plates, eliminates metal-to-metal contact... assures long service life and achieves fuel savings.

and add up to 50% more engine horsepower for all these applications too!

TRACTORS

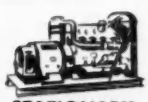
CONSTRUCTION EQUIPMENT

LOCOMOTIVES

BUSES

MARINE

TRUCKS



STATIONARY PLANTS

The four exclusive features shown above are typical of the big difference between Miehle-Dexter superchargers and other units. Features like these pay off in *bonus power*—up to *50% or more* when you put performance-proved Miehle-Dexter superchargers on Diesel or gasoline engines.

More, these features are the key to longer supercharger service life... efficient performance. There's a dividend in fuel economy, too.

Yes, if you want more usable horsepower without additional weight... without sacrificing valuable space, it's time to specify Miehle-Dexter superchargers. For more facts, call or write Miehle-Dexter.

MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY

[illegible] Fourth Street ▼ Racine, Wisconsin

News of the

MACHINERY INDUSTRIES

(*Continued from page* 63)

Apart from the evaluation of weight, investigations of stiffness and temperature effects have been published recently in Russia. One suggestion made by the Russians in respect to the stiffness criteria of a horizontal milling machine is to measure it by its vibrational frequencies.

Among standard Soviet machine tools, an interesting item is a centerless grinder with an exceptionally wide grinding wheel—31½ in. Russian engineers claim that this development can increase productivity 3½ times, compared with centerless grinders of conventional wheel width. This grinder has been found suitable not only for the grinding of long shafts, but also for the simultaneous grinding of a number of short components and in this role has been incorporated with success into automatic production lines for the manufacture of pistons and ball races.

From the time the raw materials enter the plant, Burton Leaf Springs are manufactured under scientific guidance. They are continuously observed and supervised to determine wearing qualities and carrying capacity, and are accurately matched to insure maximum road performance.

Burton Springs, which are used on such heavy duty transport vehicles as the Trailmobile, shown here, have found wide acceptance throughout the industry.

Perhaps you need help with an individual spring problem. Take advantage of the scientific research of our engineering staff and consult with Burton today.

Put the Burden on Burt Basco

Burton AUTO SPRING CORP.
48th ST. at WESTERN AVE.
Chicago 32, Illinois

Lift Truck Showing

Recently, The Buda Co., Harvey, Ill., invited some 300 business and industry executives for the premiere of its materials handling show in Chicago. This was the kickoff for a nationwide tour of the show which will be held in all principal cities.

A major part of the program dealt with Buda's FT models, and an impressive showing was made by featuring complete disassembly in 22 min, and an actual clutch change in 30 min. In an action part of the show, the company demonstrated truck maneuverability, short turning radius, precision control and the ability to stop, stand, and start again on a 20 per cent grade. It was pointed out that 85 per cent of the parts used in the 36 models displayed were interchangeable.

Government's Central Inventory Out

New juggling of Government's capital equipment policy does away with the central inventory now managed by National Production Authority, tosses back to the Defense Dept. the job of storing and letting out its own idle tools.

U. S. Commerce Dept. takes over tse inventorying work and the responsibility for warehousing and looking after all Government capital equipment other than that owned by the military services.

Present military plans are to try and lease back to private industry, on a fixed basis, as many tools as possible which will be idled by expiring defense contracts over the coming 18 months.

A secondary move will be to have the companies themselves store as many excess tools as possible in their own plants and to get commercial warehousing space near these plants for the runover.

Both Defense and Commerce Departments expect to announce quickly the procedures and types of equipment which may be leased.

Meanwhile, until the Commerce Dept. gets equipment lists and finds out exactly what it is holding for the Office of Defense Mobilization, no leasing will be approved for the following: Machine tools or equipment now in machine tool, cutting tool, and industrial gage plants for expansion of capacity; equipment installed for producing huge machine tools; or equipment necessary for operating standby lines maintained for reserve or emergency.

Bendix automotive Electric Fuel Pump

Prevents Vapor Lock

Result

- **better performance**
- **better gas mileage**
- **reduced service expense**

Today it's more important than ever that car and truck manufacturers take every precaution to prevent vapor lock in their vehicles. Modern design and more volatile gasoline contribute immeasurably to increased power and speed; but in achieving these desirable goals heat problems are sometimes increased to the point where vapor lock occurs. Then, gas mileage is reduced, gains in power and speed are nullified, and worst of all, if vapor lock occurs frequently, exhaust valves burn out and expensive overhauls are necessary.

Fortunately car and truck manufacturers can now guard against this hazard. By installing Bendix* Electric Fuel Pumps, vapor lock can positively be prevented and the efficient performance built into the vehicle will be delivered under every operating condition.

In today's competitive market, here is small investment that will pay big dividends in increased customer satisfaction. Descriptive folder available on request.

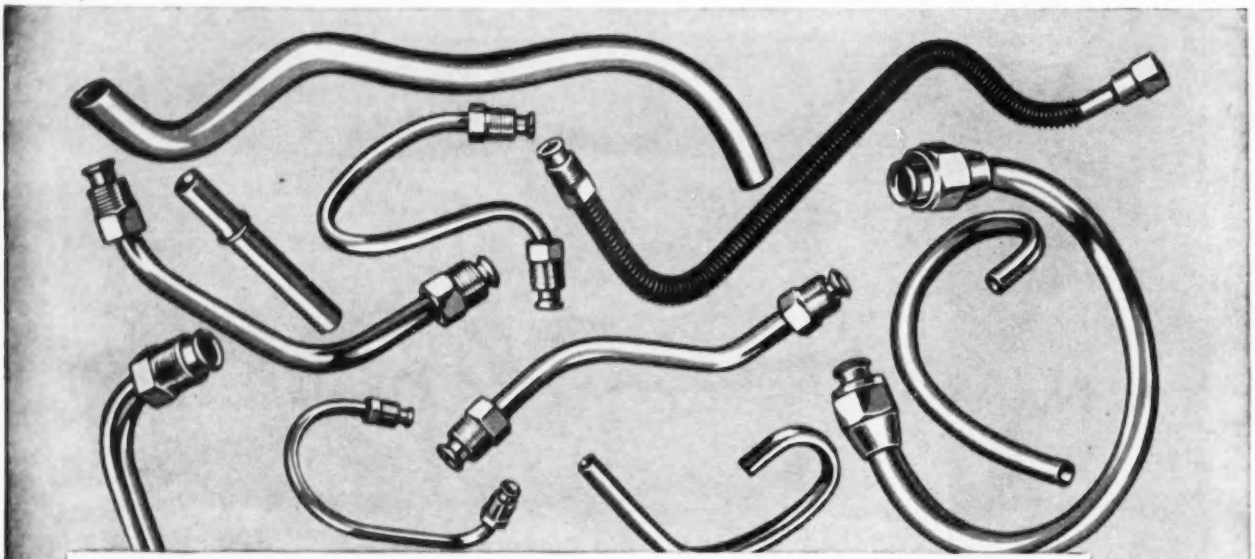
*REG. U.S. PAT. OFF.

Check these Features

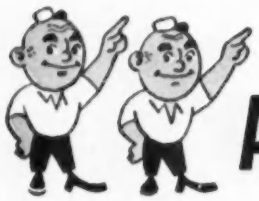
- Prevents vapor lock.
- Built-in pressure release—no flooding.
- Instant hot weather re-starts.
- 30 gallons per hour.
- Helium sealed—for longest life.
- Better cold weather starting.
- Only 7 watts power at maximum fuel delivery.

ECLIPSE MACHINE DIVISION

Elmira, New York · Division of Bendix AVIATION CORPORATION



Here is a small sampling of the variety of parts produced for Bundy automotive customers. Many of them involved close cooperation between Bundy engineers and the customers in solving problems of design and function. Are your tubing designs simple or complex? Do they call for swaging, flattening, expanding, brazing, saddle jointing, bending to small radii, piercing, upsetting, slotting, threading, angle cutting, notching, flanging, flaring, reducing, tapering, other fabrication operations, or combinations of the above? Come to Bundy for the automotive industry's most reliable tubing, most helpful engineering talents, and most versatile fabrication facilities.



Almost no limit to what we can do for you with Bundyweld Tubing

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

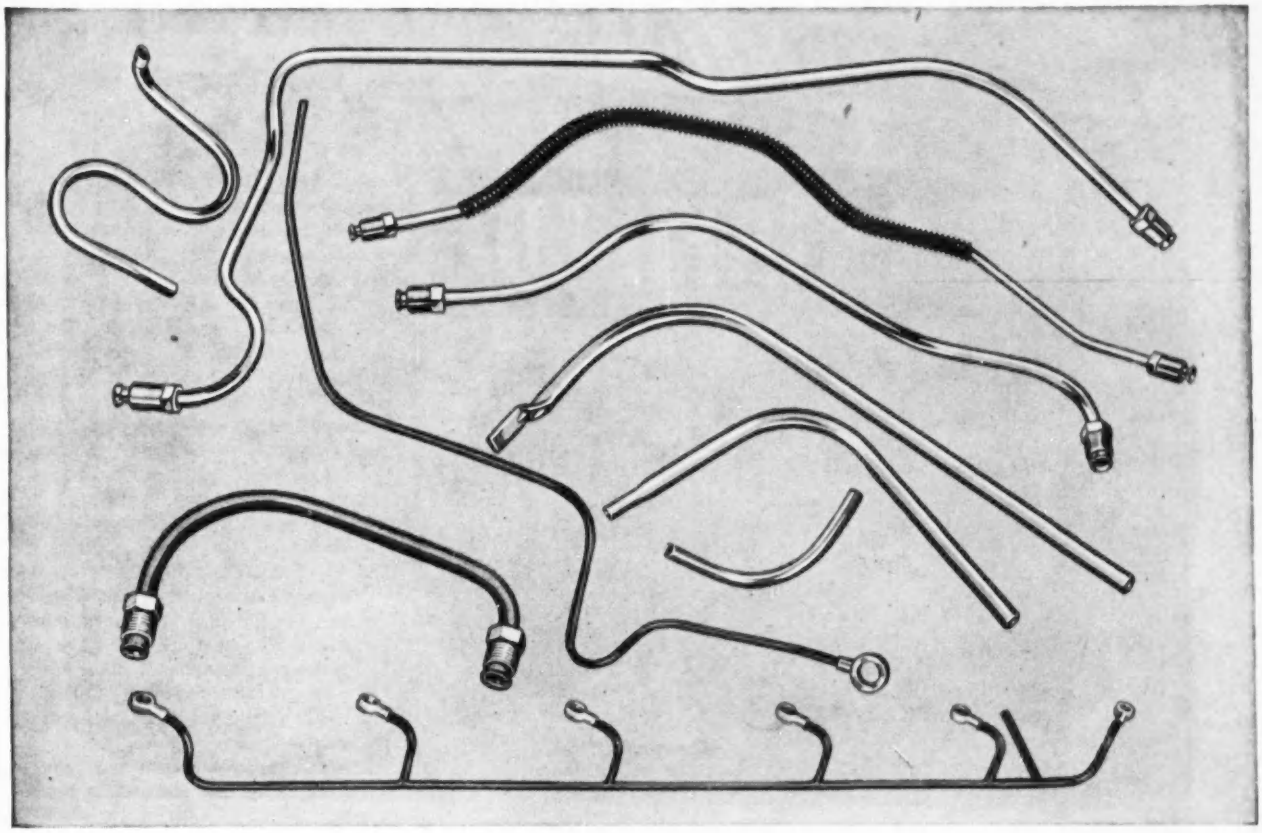
continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: ***Cambridge 42, Mass.:*** Austin-Hastings Co., Inc., 226 Binney St. • ***Chattanooga 2, Tenn.:*** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • ***Chicago 32, Ill.:*** Lapham-Hickey Co., 3333 W. 47th Place • ***Elizabeth, New Jersey:*** A. B. Murray Co., Inc., Post Office Box 476 • ***Philadelphia 3, Penn.:*** Rutan & Co., 1717 Sansom St. • ***San Francisco 10, Calif.:*** Pacific Metals Co., Ltd., 3100 19th St. • ***Seattle 4, Wash.:*** Eagle Metals Co., 4755 First Ave. South ***Toronto 5, Ontario, Canada:*** Alloy Metal Sales, Ltd., 181 Fleet St., East • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**



It almost goes without saying that you can't beat Bundyweld for leak-proof, dependable performance in your brake, oil, and gasoline lines and in other tubing lines throughout your cars, trucks, or tractors.

But you get more than peace of mind with Bundyweld. For instance, you tap a wealth of fabrication facilities and engineering skills.

Do your tubing part designs call for difficult fabrication operations or easy ones? Do the designs call for unusual combinations of operations? Do they create problems that may seem unsolvable?

If your needs call for a tubing part that is at all produceable, you can count on us to do the job—exactly to specifications at lowest possible cost to your company. But say it isn't produceable. What then?

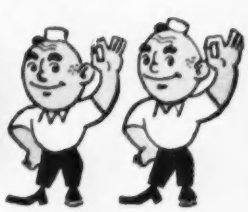
Just this. Bundy engineers who know their Bundyweld and automotive tubing problems inside and out will work with you personally until problems turn into solutions. This help and teamwork pay off in time and trouble saved. And such a pooling of specialized skills—yours and the Bundy man's—frequently pays off in lowered material costs and lowered production costs, too.

What if *your* company is geared for low-cost fabrication? Wonderful. You can count on us to ship clean, carefully inspected Bundyweld on time and in specified straight lengths. Of course, you can still summon all the engineering help you can use.

For tubing that's the standard of dependability, for fabrication facilities and engineering talents devoted to producing better parts at lowest possible cost, come to headquarters for small diameter tubing.

BUNDY TUBING COMPANY
DETROIT 14, MICHIGAN

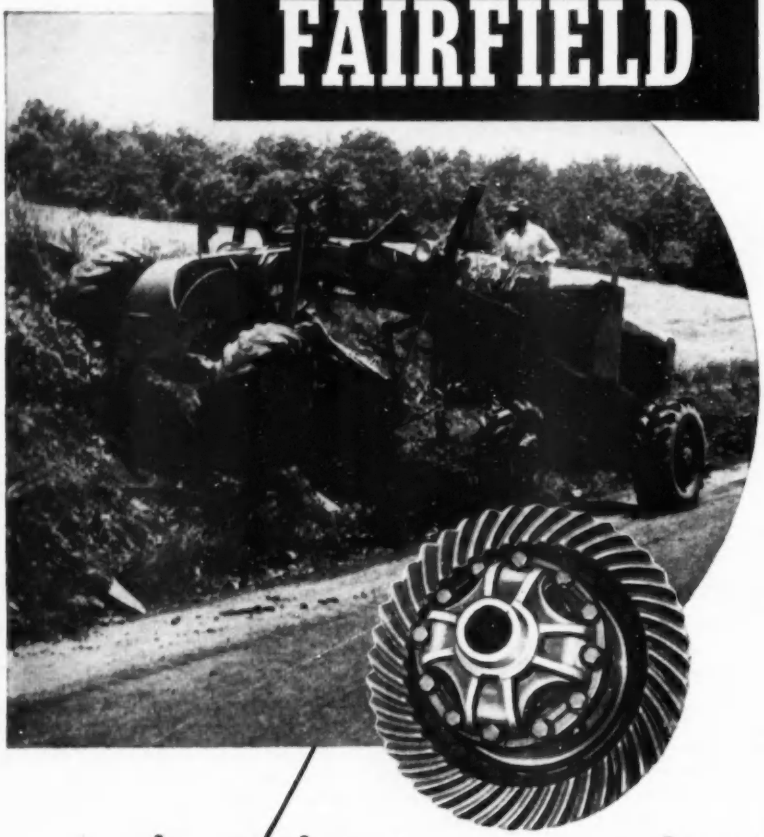
Bundyweld® Tubing



DOUBLE-WALLED FROM A SINGLE STRIP

DIFFERENTIALS by

FAIRFIELD



—a plus value in any product!

ROAD GRADERS . . . Lift Trucks . . . Power Shovels . . . Tractors . . . Street Sweepers . . . Road Rollers . . . Trucks and Buses all benefit from Fairfield's 34 years of specialized experience in building complete *differential gear units* for powered vehicles.

If you use DIFFERENTIALS in the product you build, we believe it will pay you as it has others to check with Fairfield on all of your requirements. Fairfield offers (1) Mass Production Economy, (2) Unexcelled Quality, (3) Dependable Service, (4) Expert Engineering Recommendations. YOUR INQUIRY WILL RECEIVE PROMPT ATTENTION. *Send for illustrated brochure, describing Fairfield's facilities.*

FAIRFIELD
MANUFACTURING CO.
2303 South Concord Road, Lafayette, Indiana

For FINE GEARS

Novel Diesel Burns Wide Range of Fuels

(*Continued from page* 41)

stand, it was found that success could be achieved only if the intake port system would direct the stream downward against the piston crown, whereas the exhaust ports were directed upward. This configuration was found by a combination of test and flow analysis. By the time the system was tested, accompanying analysis had progressed to the point of establishing the belief that two conditions were necessary for the successful formation of a mushroom type scavenging system:

(1) The possibility of formation of a central upward flow column.
(2) The necessity for the central column, once it was established and flowing in a mushroom type scavenging pattern, to have a smaller hydrodynamic loss than a flow pattern which would short-cut directly from the intake ports into the exhaust ports.

For the first condition it was found to be necessary that the stream coming out of the intake ports would impinge upon the piston crown at a flat angle. The reason for this is believed to be that this will assure clinging of the jet to this piston crown until it has reached the center. For the second condition it seemed to be necessary that the exhaust ports be slanted upward.

The system finally selected was called the in-line port system. In this system an attempt was made to modify the principle of impinging the intake jet at a slanting angle upon the piston crown by giving the piston crown a cone shaped upper part and thus being able to drill intake and exhaust port at the same angle. It was found possible to stabilize even this configuration, although in this case only such port arrangements were stable where the intake ports were smaller in area than the outlet ports by a definite ratio. Larger intake ports than the critical ratio would result in short-cut flow. Attempts were made to cut the tip of the cone off as much as possible. Corresponding to the basic pattern (until the formation of the central column the jet has to be guided by the piston crown), this was successful only to a certain quite sharply defined point. If truncation of the cone was carried further, short-cut or unstable flow resulted again.

STAINLESS STEEL KITCHENWARE

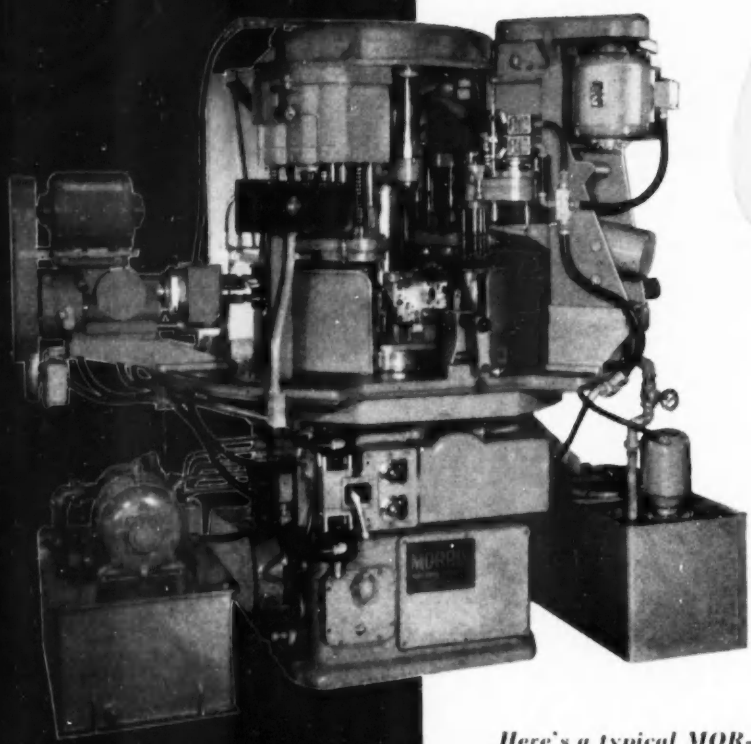
McLouth STAINLESS Steel

For the product you make today and the product you plan for tomorrow.

McLouth Steel Corporation
DETROIT, MICHIGAN
Manufacturers of Stainless and Carbon Steels

how little does it cost...

to get "special machine" production with combination standard units?



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

Here's a typical MOR-SPEED answer to an ever-more important problem:

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production *and* precision can be yours for less than you might imagine.

a better product at less cost with precision - plus production

Bellows MOR-SPEED Line

Morris

THE MORRIS MACHINE TOOL CO.

938 HARRIET ST., CINCINNATI 3, OHIO

The Business Pulse

(*Continued from page* 78)

have been such an important element during recent boom months.

New Construction

Outlay on new construction totaled $3.2 billion during June, eight per cent higher than a year earlier. This raised expenditures for the first half of the year to about $16 billion, a new high for the January-June period even after adjustment for price changes. Despite this excellent first-half performance, builders continue to express concern as to prospects during the latter part of the year. They cite the declines in both May and June in new housing starts and complain that higher interest rates have not appreciably increased the supply of mortgage money. Spokesmen for the building industry have urged that down-payment requirements on Government-guaranteed mortgages be liberalized. While Congress recently passed a bill authorizing such action by the President, there seems little immediate prospect of actual liberalization, since it is believed that the Administration will prefer to wait until there is more conclusive evidence of a construction slowdown.

Inventory Accumulation

Preliminary estimates of gross national product for the second quarter of the year reveal that personal consumption expenditures, investment outlay and governmental purchases all registered gains as compared with the first three months of the year. Despite these advances, final demand did not quite keep up with the record pace of output, with the result that a rather sharp upturn occurred in the rate of inventory accumulation. On a seasonally adjusted annual basis, the growth in business inventories during the period is placed at $4.5 billion, as against a rate of $1.7 billion during the preceding three months. Part of the rise was attributable to voluntary additions to holdings in some nondurable-goods industries, where stocks have been considered low in relation to sales volume. More important, however, was the involuntary accumulation of certain consumer durables as a result of disappointing retail sales. In general, inventories still do not appear to be out of line with current

CAMCAR

UP TO THE MINUTE

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Continuous Inventory of

AN NAS CT SCREWS • PHILLIPS HEAD • INDENTED HEX HEAD • SHEET METAL • SEMS • STANDARDS • SPECIALS

Steel, Brass, Stainless Aluminum

For Prompt Shipment

Assembly line fastener supply—right at your fingertips. That's what Camcar Stock List Service gives you twice monthly.

Use this Stock List for quick service on your Fastener Supply Problems. Request on Your Letterhead Will Bring Regular Mailing.

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CAMCAR SCREW & MFG., CORP.

606 Eighteenth Avenue • Rockford, Illinois

"PRODUCTION-DESIGNED FOR YOUR ASSEMBLY LINE"

Saves $5000 per year using $225 DUMORE® AUTOMATIC DRILL HEAD

The Drill Head speeds and simplifies work on small, close precision parts such as a 1" long brass rocking shaft, a brass connecting link with a .0135" hole, or a ⅛" rod of high carbon steel with two No. 60 drill holes.

Precision parts manufacturer assures accurate, close tolerances with DUMORE Tools

THIS manufacturer produces small aircraft instrument parts frequently requiring tolerances measured in ten thousandths of an inch. To handle small hole drilling in materials ranging from brass to high carbon stainless steel, a $225 DUMORE Automatic Drill Head was purchased.

Here's how it paid off: (1) In 500 hours' operation, the Drill Head tripled output, accounted for savings of $5000 in the cost of production alone. (2) It eliminated the need for premium skilled help as it is automatic, takes speed, feed, pressure and stroke out of the operator's hands. And (3) it has increased drill life by 400% or more!

As a company official put it, "We have found that this Drill Head will do things we have *never* been able to do with any other tool."

In these days of rising costs and a shrinking supply of skilled labor, can you afford not to check into the amazing advantages of DUMORE Tools? For details see your industrial distributor or write.

DUMORE PRECISION TOOLS

The Dumore Company

1339 Seventeenth Street • Racine, Wisconsin

sales volume, but the second-quarter rate of accumulation seems to be in excess of that which could be expected on the basis of normal growth factors alone and therefore must be considered as a potentially unfavorable development. Fortunately, manufacturers appear to be mindful of the need for caution, as indicated by the prompt reductions which have been effected in production schedules in some lines of consumer durables with the appearance of sluggishness in markets.

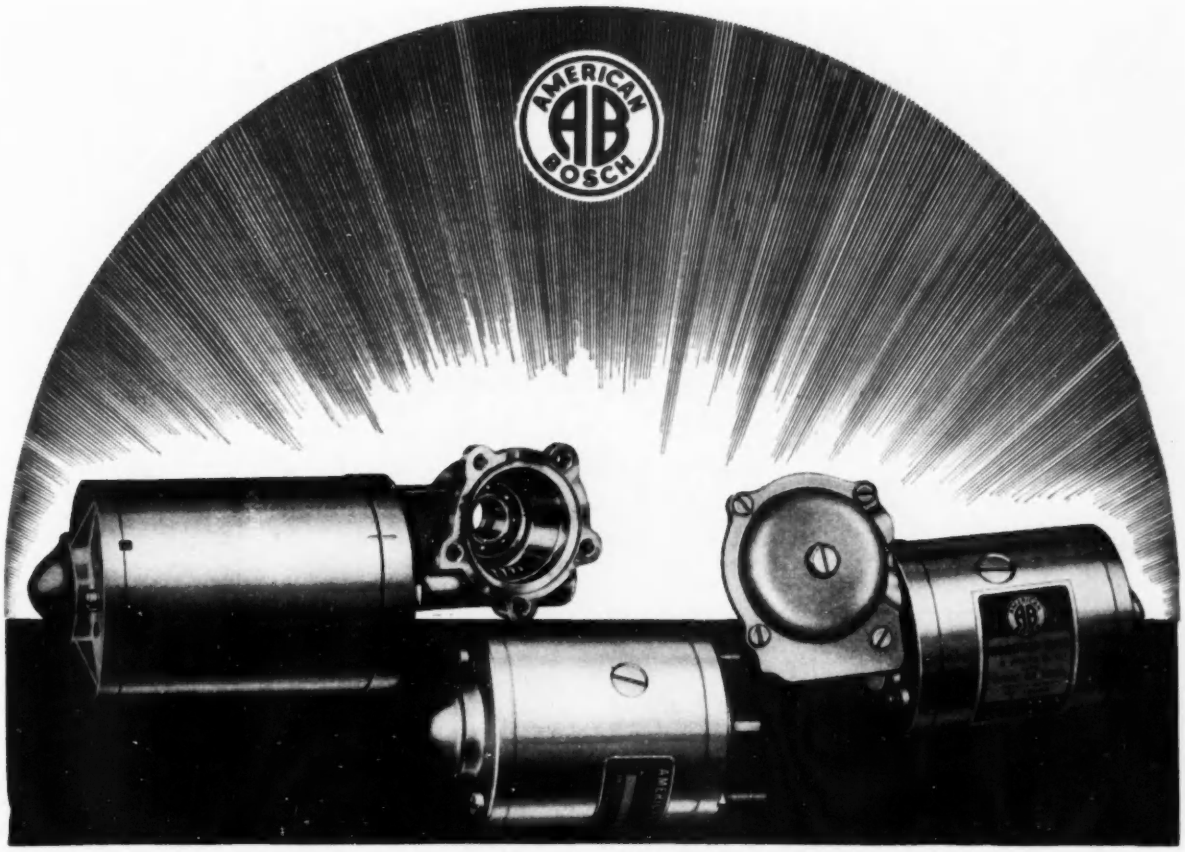
Prices Up

Heightened competition has continued to feature those markets where stocks of consumer durables are above desired levels, and some price shading has resulted. However, the general tendency of prices has recently been upward, particularly in basic commodity markets. The wholesale price index of the Guaranty Trust Co., for example, registered an advance of 1.8 per cent between mid-June and mid-July, rising to the highest level since December, 1952. Farm commodities contributed largely to this increase. Similarly, the weekly index of average primary-market prices compiled by the Bureau of Labor Statistics showed a rather sharp rise during the same period. Higher food prices were accountable for an increase of about one half of one per cent in the consumers' price index in the month ended June 15. This was the sharpest rise in almost two years and carried the index to an all-time high of 114.5 per cent of the 1947-49 average. For the most part, however, recent price increases can be explained in terms of particular demand-supply situations, and the greater firmness is not thought to foreshadow any resumption of general inflation. With little prospect of any sharp upward movement in general business activity, the feeling seems to be that there simply is no basis for an extended and generalized price rise at present.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING



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A LARGE FAMILY OF SMALL ELECTRIC MOTORS FOR AUTOMOTIVE SERVICES

High torque type ... sturdy, quiet, well built ... with characteristic American Bosch precision quality. Many in wide use as original equipment on automotive vehicles. If you have a decimal horsepower motor requirement in YOUR Equipment —put the problem up to: American Bosch Corporation, Springfield 7, Massachusetts.

ALL ELECTRIC MOTORS FOR:

WINDSHIELD WIPERS • WINDOW LIFTS • SEAT ADJUSTERS
TOP LIFTS • HEATERS AND OTHER MECHANISMS

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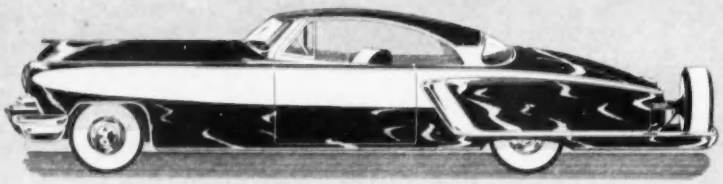
PRESSTITE
SEALING COMPOUNDS

Seal in the Quality
of Automobile Bodies



... by sealing out problems of
DUST • WATER • RUST • AIR

Sleek new automobiles, efficient trailer homes, rugged heavy-duty trucks . . . all contain fine qualities that must be protected and sealed against destructive attacks of the elements. Sealing quality *in* begins with sealing dust, water, rust and air *out!*

Whether the problem is sealing rust and corrosion out of metal seams, sealing water and air out of windows, sealing gaps in metal seams or sealing spot welded joints . . . Presstite either has or can formulate the sealant to fit the specific requirement.

Over 400 Presstite sealing compounds have been developed, tested and proved in thousands of applications by scores of industries such as automobile, refrigerator, railroad, aircraft, building and construction.

Perhaps your product can be improved by sealing *in* the quality, by sealing *out* deterioration and destruction.

PRESSTITE
SEALING COMPOUNDS

Seal in the quality of your product. Consult Presstite sealing specialists

PRESSTITE ENGINEERING COMPANY
3760 Chouteau St. Louis 10, Missouri

BOOKS . . .

ECONOMICS OF BUSINESS ENTERPRISE, *by Leonard A. Doyle, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $5.00.* The value of formal economic theory in the conduct of business enterprise is something about which there is considerable difference of opinion in colleges and schools of business administration and in business itself. This book stems from the conviction that the economic theory of the firm should be the core of work in business administration at both the undergraduate and graduate levels. It provides a presentation of economic analysis in terms of techniques which are or can be used to advantage in actual business. The analytical techniques emphasized in the book are variations of the total-revenue—total-cost approach incorporated in the break-even chart and the profit graph. The unit-cost and unit-revenue curves of conventional economic analysis are used at many points in the presentation, but an effort is made to emphasize the fact that the precise analysis of conventional theory assumes data concerning marginal cost and marginal revenue. An attempt is made throughout the analysis to integrate the general approach of conventional marginal theory and the techniques of comparing only a few proposals. The emphasis throughout the analysis is on price and output decisions. Considerable attention is devoted to cost behavior under static and dynamic conditions. An effort is made in the text to provide reasonable techniques of cost analysis and comparisons of cost under alternative methods of operation. The area of economic theory concerned with income and its distribution is given summary treatment in Chapters 14 and 15. The emphasis in these chapters is mainly in terms of the problems posed for the individual firm. Questions designed to extend the analysis to points not covered specifically in the text are provided at the end of each chapter.

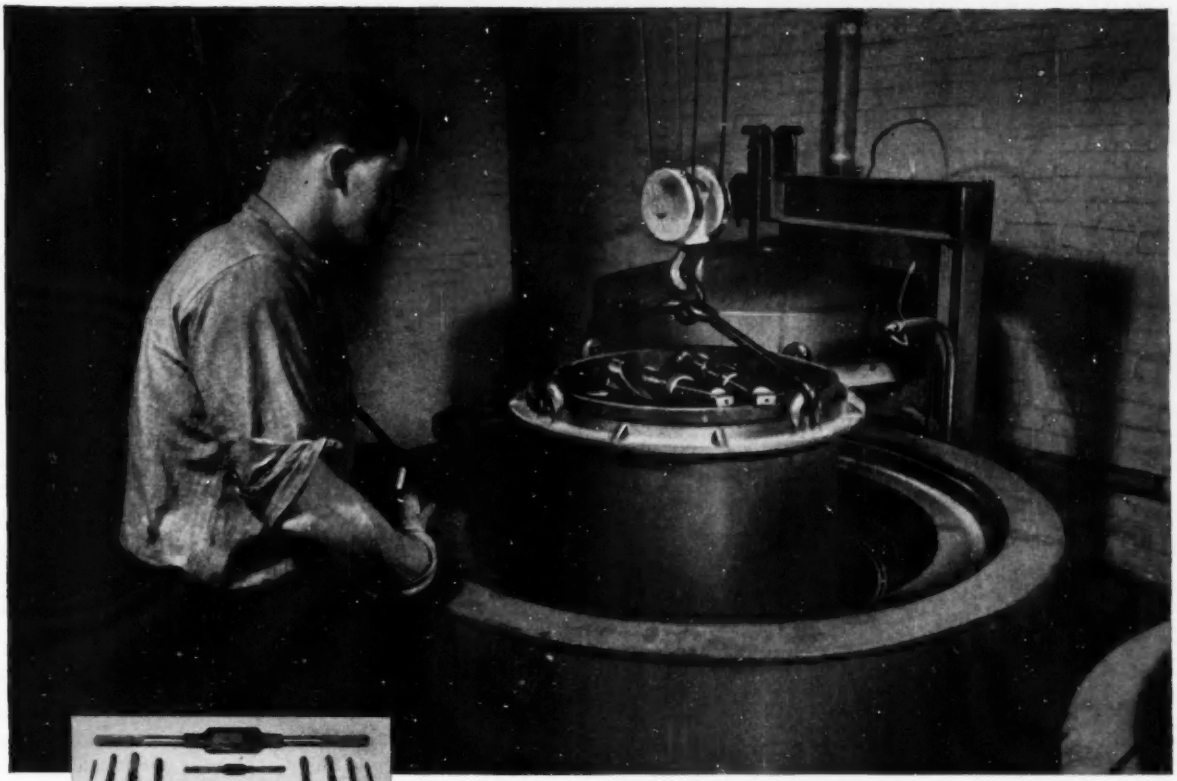
$35 Billions More Available

(*Continued from page* 45)

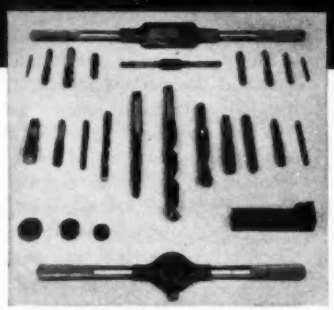
three combat air wings. In fact, funds for shipbuilding include provision for starting a third carrier of the Forrestal class.

Instead, Navy procurement will be aimed at replacement of losses through crashes, wear and obsolescence, at increasing the number of first line planes, and at guaranteeing maintenance of a minimum production line capable of rapid expansion at short notice.

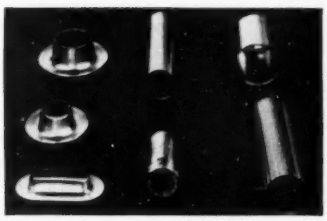
As presently provided for, the Navy expects to shoot for 80 per cent modernization by the end of 1955. This is at a slightly slower rate than had previously been scheduled, but would be only slightly below the 90 to 95 per cent maximum modernization which experts generally agree is possible.



Loads are easily handled in the Steam Homo Furnace.



STEAM ATMOSPHERE HEAT TREATMENT *is becoming standard for many high speed steel cutting tools. It's effective for tools machining average jobs . . . is even better for treating tools handling tough jobs, such as working high-chrome, high-carbon steels.*



COST CUTS OF 53% *. . . in annealing and pickling, effected through steam-atmosphere annealing of these brass stampings.*

For full information about Steam Homo tempering, send for the NEW 12 page catalog, "L&N Steam Homo Method for Heat-Treating". Write our nearest office, or 4966 Stenton Ave., Phila. 44, Pa.

Want Heat-Treating Versatility?

CHECK THESE STEAM HOMO® ADVANTAGES

You get many outstanding heat-treating advantages when you buy the versatile Steam Homo furnace. Here's why:

- Steam Homo gives you scale-free heat-treating of both ferrous and non-ferrous parts at temperatures to 1150 F.

If you're heat-treating ferrous parts:

- The tough oxide film that Steam Homo imparts adds 20–25% more life to high-speed tool steels.
- Steam-treating adds appreciably to the hardness and compressive strength of powdered iron compacts.

Or if you're heat-treating non-ferrous parts:

- Steam atmosphere in many cases eliminates subsequent surface cleaning and pickling operations.

But in both cases you'll get:

- A compactness which makes the Steam-Homo equipment ideal for installation directly in production lines.
- A steam atmosphere heat-treating process which is entirely safe and easy to follow.

Standard Steam Homo furnaces are made in a variety of sizes . . . from those with work spaces as small as 11½" x 15" to those as large as 28" x 60". All are supplied as assembled units, ready for installation.

LEEDS [LN] **NORTHRUP**

instruments — *automatic controls* • *furnaces*

Jrl. Ad. T-620(40)

Towmotor dumps pot of annealed castings into shakeout hopper at Cleveland plant of Eberhard Manufacturing Co.

TOWMOTORS IN ACTION IN U. S. INDUSTRY

BOTTOMS UP!

Here's to TOWMOTOR, the fast and economical way of handling materials! Easy, too, because TOWMOTOR Power Steering reduces steering effort 80%! And speaking of power, the new "Cushioned Power" Diesels are as gentle and economical as ponies—with all the terrific strength of wild horses! There are dozens of other features that make special jobs like the one above, mere routine, and make *your* job twice as important to the boss. Send today for free booklet, "What Makes It Tick?" TOWMOTOR CORPORATION, Div. 4508, 1226 East 152nd Street, Cleveland 10, Ohio.

TOWMOTOR
THE ONE-MAN-GANG

FORK LIFT TRUCKS and TRACTORS

SINCE 1919

TOWMOTOR ENGINEERED FOR QUALITY PERFORMANCE

Brazing and Soldering TITANIUM

(*Continued from page* 37)

It soon became apparent that the need for a faster and more direct method of producing a hermetic seal was needed because of production requirements.

To remedy the complicated preparations of machining a receiving dam for a silver overlay, then brazing the silver overlay in place and finally machining the silver overlay to conform to the finished product, an inert-arc soldering process was used.

Unfortunately this method of soldering does not permit the utilization of capillary flow. Capillary flow, of the molten solder, will not take place except within the immediate proximity of the arc immision area. Consequently, this particular type of application does not lend itself to general soldering practices, only to those that embody a filling operation where sealing is mandatory but stress is low.

Figure 11 shows a reasonable facsimile of the method adopted for sealing the titanium sphere assembly. The end cap was threaded in place and then sealed with 50/50 (Sn/Pb) soft solder, using a Heliarc torch, argon gas, and an alternating current high frequency welding machine. The machine setting was on the low range, 15 to 20 amperes. Prior to soldering, the titanium parts were cleaned by vapor blasting.

Helium "sniffer" tests of this particular part recorded a helium leak rate of less than 2.5×10^{-8} cc/sec which is equivalent to the leak rate of helium passing through pyrex glass.

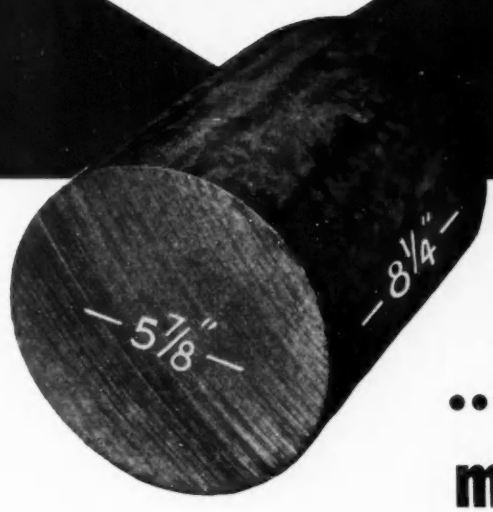
Reliance Mobile Units Show Electrical Goods

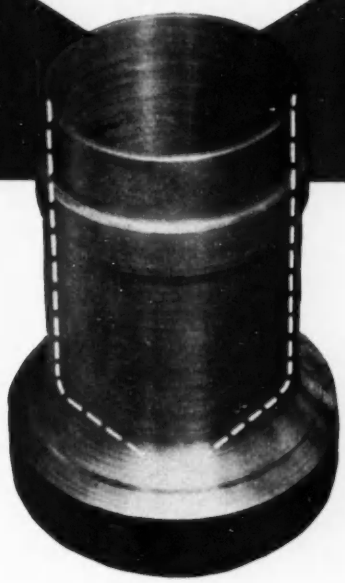
Two unusual mobile exhibits of electric motors, motor-drives, and associated controls are currently touring through various sections of the country. The unique industry-touring units, sponsored by Reliance Electric and Engineering Co., have been designed and fitted out to facilitate on-the-spot demonstrations and discussions of production applications of the equipment with factory and mill management and maintenance men, production managers, plant superintendents, electrical engineers, and purchasing agents.

THIS **63-lb.** 4150 STEEL BLANK

reduced to

THIS **18-lb.** SEMI-FINISHED COLLET





...in 13 minutes

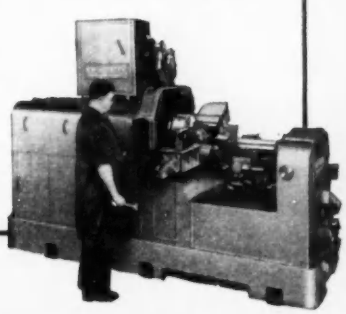
ON THE NEW **12" MC-UNIVERSAL**

ACME-GRIDLEY

Single Spindle Automatic Chucker

FEATURES

- **Six spindle speeds and three feed ranges, *all automatically selective* for each combination of change gears. Spindle speeds range from 25 to 1478 RPM.**
- **Five end working tool slides and two side slides each independently cammed. Turret indexing located in rugged outer turret support and driven by separate motor independent of cross slide operation.**
- **Open type tooling zone, large chip area, minimum change of cams. Interchangeable spindle speed and feed change gears—all contribute to quick change-over from job to job.**
- **Work cycle automatically controlled—no time loss between loading and unloading work piece.**
- **Strength to sustain close tolerance at the fastest feeds and highest speeds modern carbide cutting tools and hardened steel cams can take.**
- **Compact, accessible and free from complications — one man runs 2 or more machines.**



The floor to floor time on this particular job is *5 times faster* than the previous method employed.

The job is typical. If savings like this—in man hours—in floor space, overhead—*total costs per job*—are important in your chucking work, why not ask us to help you make similar comparisons—get the facts.

Complete catalog, MC-53

You can't do TODAY'S job with YESTERDAY'S tools—and be in business TOMORROW.

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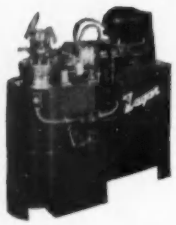
Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle —Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

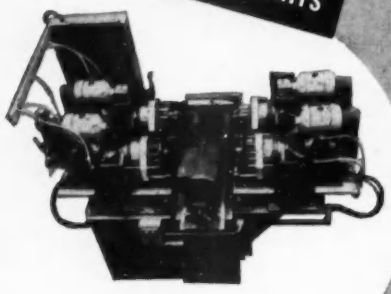
Go Beyond the Call of the Job...

with Zagar SPECIAL DRILLING MACHINES!

EQUIPPED WITH ZAGAR'S HYDRAULIC FEEDER UNITS



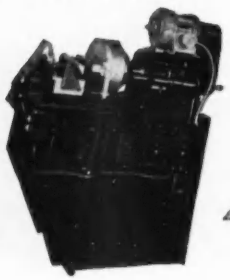
Drills three holes in foot-step bearing for weaving machine.



Drills and taps 16 holes in truck transmission case.

Drills 28 holes in hydraulic piston and sleeve of hydraulic steering unit.

Drills 27 holes in gas oven burner.



Zagar presents a new outlook on machines built for single, long production runs. A machine equipped with Zagar Gearless Drillheads and Hydraulic Feeder Units has use long after completing the job it was built for. Each gearless drillhead and each feeder unit on Zagar "Specials" is complete in itself. Any one or all of them can be removed and remounted in any sequence to produce on other production jobs. Standard Zagar Drillheads are adaptable to standard drill presses or special machines of your own make. Write us for detailed information on the basic equipment used in Zagar Special Drilling Machines.

Write for Engineering Manual "U-8" for more information on all Zagar's tools for industry.

ZAGAR TOOL, INC.

24000 LAKELAND BLVD. • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

SHORTIES

A 35,000-ton press equals the weight of a battleship.

•

About 700 forgings are used in a typical jet engine.

•

America's highway system has proved completely inadequate to handle the 53 million motor vehicles now on our roads—yet experts predict the nation will have 80 million cars by 1975.

•

In 1925, oil and gas accounted for only 28 per cent of the nation's energy requirement. Now, they account for 57 per cent of the total and are expected to continue this increase.

•

Before the average American car is scrapped, it will have consumed 8000 gal of gasoline and run up $588 in gasoline taxes.

•

Approximately one million miles of U. S. local roads, or 40 per cent of the total, are used by less than ten vehicles daily.

•

Exactly 14,698 bolts or rivets are used in a B-47 bomber wing.

•

Sufficient magnesium exists in the oceans to cover the earth's surface to a depth of nine ft.

•

Although 10,000 special tools were required to build one of World War II's most powerful piston engines, 20,000 are needed to build a modern axial flow jet engine.

•

One jet engine generates enough heat to warm 1372 five-room houses.

•

Temperatures up to 2800 F are needed to obtain fusion in welding stainless steel for aircraft.

The SURFINDICATOR *weighs only 15 pounds and can be set up anywhere in the plant where 115 volts a. c. is available. Completely self-contained.*

Manufactured under patent license from General Motors Corporation

NEW... the BRUSH SURFINDICATOR*

a practical shop tool for measuring SURFACE ROUGHNESS

WITH THIS NEW, portable inspection tool you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected and then reads surface roughness in average microinches on the meter.

The SURFINDICATOR is *always reliable* because the unit is equipped with a set of Precision Reference Specimens. These permit checking accuracy of the instrument at any time and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can all produce parts to the same surface roughness specifications. Get the complete story on the SURFINDICATOR now!

*Trade Mark

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Brush Electronics Company, Dept. BD-8
3405 Perkins Avenue, Cleveland 14, Ohio

Please send bulletin on the SURFINDICATOR.

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Company .....

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Address .....

City ..... *State* .....

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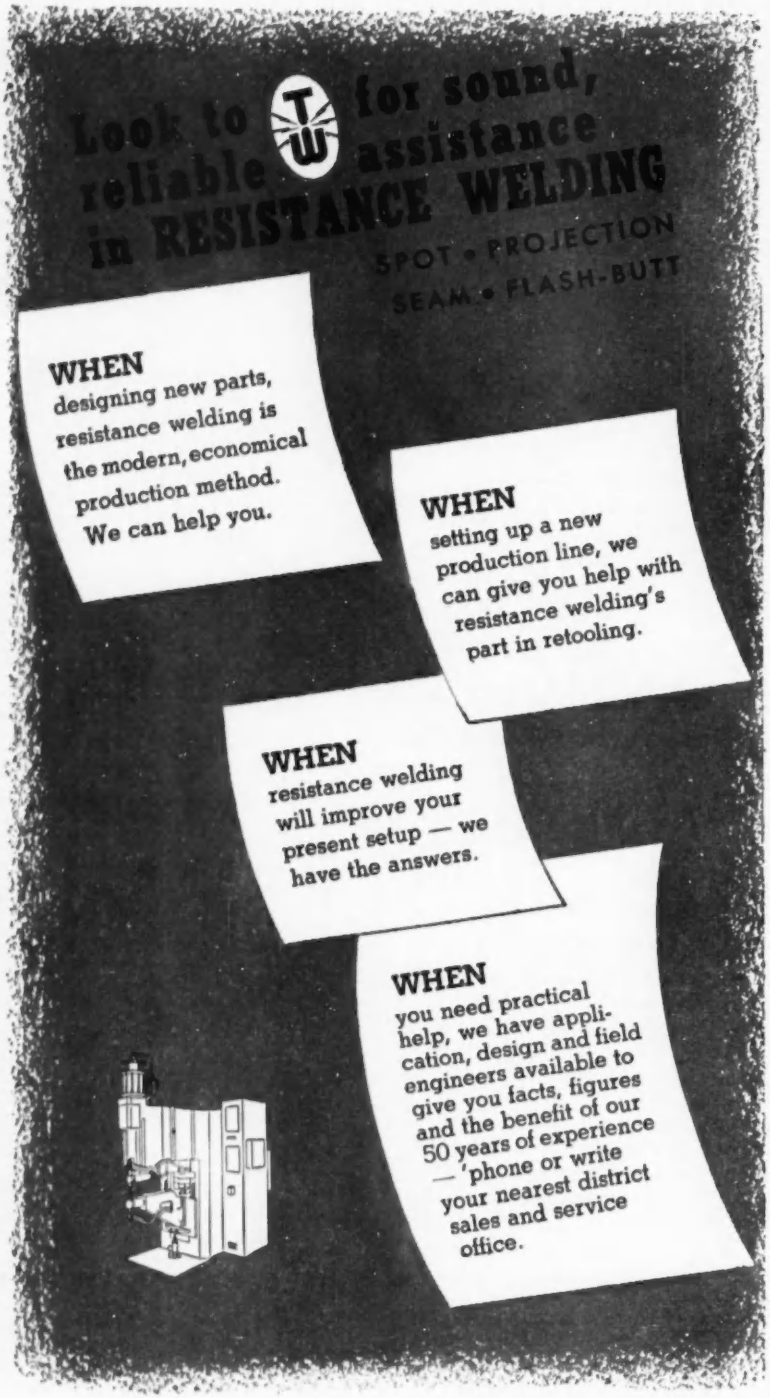
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WHEN designing new parts, resistance welding is the modern, economical production method. We can help you.
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TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

AIRBRIEFS

(*Continued from page* 80)

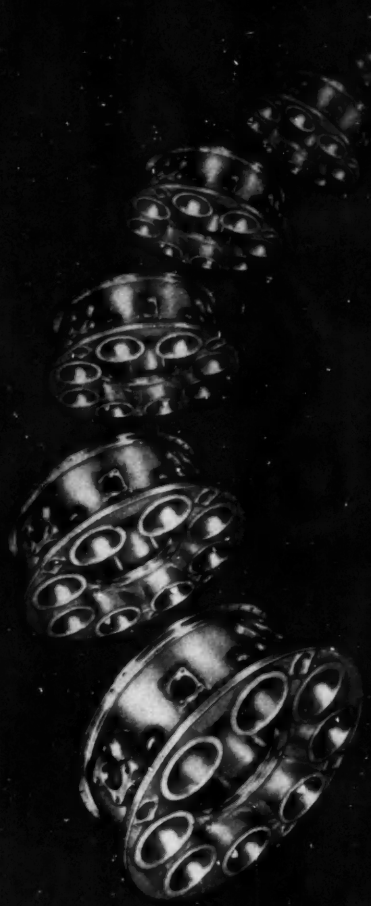
New Speed Record

It is one of the oddities of transonic flight phenomena that the new world's speed record of 715.7 mph established by a North American F-86D Sabre piloted by Lt. Col. William Barns was made at precisely the same Mach number as the old record of 698.5 mph set in the same type airplane last November by Capt. Slade Nash. In other words, the two airplanes were going at the same speed, aerodynamically speaking. This paradoxical situation is explained by the fact that the speed of sound varies directly with the air temperature. During Capt. Nash's run last winter, the temperature was only 75 F and, therefore, the actual "miles per hour" obtained was only 698.5, although the machine was traveling at 91 per cent of the existing speed of sound. When Col. Barns passed over the course at the same 91 per cent of the speed of sound, the temperature was over 100 F, resulting in the higher "miles per hour," although both machines traveled at the same Mach number! The new record, however, is an incredible speed and, in the case of sustained flight, would permit the plane to fly from Los Angeles to New York in only three hr, 37 min. Still confusing the layman, somewhat is the fact that Bill Bridgeman's 1238 mph performance in the Douglas Skyrocket is not an official speed record. The explanation involves the rigid record requirements of the Federation Aeronautique Internationale, which requires the plane to make four passes (two in each direction) over a three-km course at an altitude never exceeding 100 meters. The Skyrocket performance was made in a slanting, rocket-like climb to an altitude of 78,000 ft!

Production

Appropriations hearings always produce the facts on U. S. Air Power and the recent hearings on the 1954 USAF budget revealed that since the start of war in Korea the Air Force has ordered 21,527 planes, of which 5722 have been delivered. Since Korea, the Navy has ordered 8796 planes, making a grand total of 30,323 aircraft ordered. During 1951 the Air Force received 4148 airplanes

(*Turn to page* 160, *please*)



WHEN
IT
COMES
TO
PRODUCTION . . .

AUTOMATIC DRILLING & TAPPING MACHINES

COME TO

HARTFORD
Special

THE HARTFORD SPECIAL MACHINERY CO. • HARTFORD 12, CONN.

(Advertisement)

News About Created-Metals

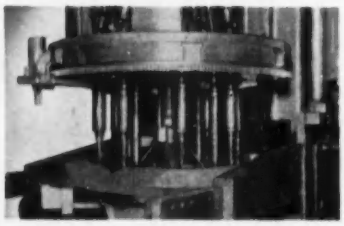
New "Brief-A-Log" Simplifies Ordering

A new condensed catalog and price list is being offered by the Carboloy Department of General Electric Company.

This "Brief-A-Log" (GT-265) incorporates Carboloy price reductions made June 22, and latest additions to the standard lines of tools and blanks.

Designed to simplify selecting and ordering, the Brief-A-Log is available free of charge. (Send coupon at right.)

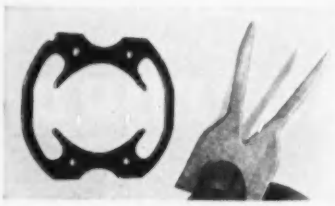
Drill Cast Iron with Carbide Twist Drills



Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Company. (See address at right.)

New Applications for Carbide Press Dies

Carboloy carbide dies are being profitably applied to blanking and piercing operations where production runs are high.



These dies are economical to use because they produce burr-free, close-tolerance work . . . outlast steel dies by 8 to 10 times.

Write for free Carboloy Die Engineering Manual D-124. (See address at right.)

YOUR CARBOLOY FIELD ENGINEER SAYS . . .

"Large, costly special

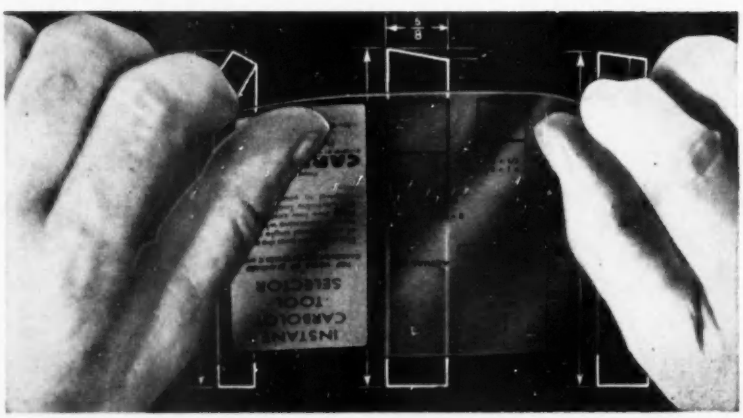
"Cut your special single-point tool stocks up to 30% with this simple-to-use MTI Plan

"The Minimum Tool Inventory Plan is based on the fact that the 11 Standard Carboloy Tools can be adapted to up to 80% of your special single-point jobs . . . thus eliminating many costly, made-to-print tools.

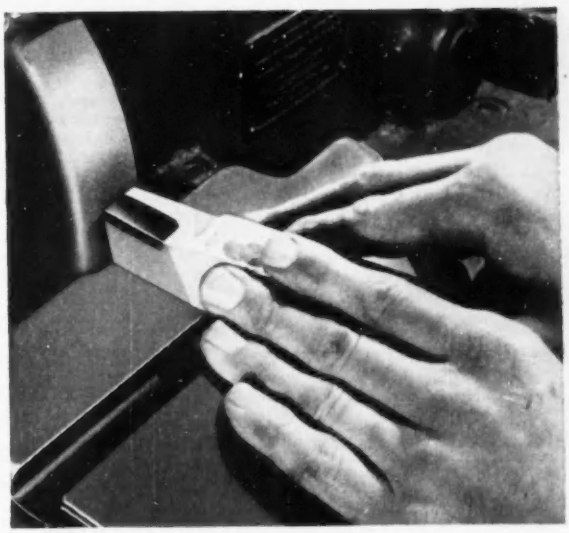
"The MTI Plan will show you which 'specials' can be eliminated, and exactly how much you'll save. With the 15% price reduction on Standard Carboloy Cemented Carbide Tools, in effect since June 22, now, more than ever before, it pays to standardize."

Send the coupon at right, attached to your company letterhead, for your free MTI Plan Kit. Then, determine your *own* benefits from the MTI Plan as follows:

1. **Using the Instant Tool Selectors,** you'll see at a glance how only 11 Standard Carboloy Tools can be easily and quickly adapted to handle 4 out of 5 of your special, made-to-print tool jobs.



inventories of tools now unnecessary"



2. **With the handy Plan Sheet provided,** you'll quickly get a dollars-and-cents answer showing how much you'll save by standardizing. Simple subtraction shows you how much your inventories can be cut by using standards.

3. **Order the Standard Tools** you'll need from your local Authorized Carboloy Distributor. Use them "as is," or quickly grind them to your specifications. Grinding hints, price lists and Standard Tool specifications are included in Kit.

AUTHORIZED CARBOLOY® CEMENTED CARBIDES DISTRIBUTORS

CARBOLOY TOOLS ARE STOCKED COAST TO COAST

Look under "Tools" in the Yellow Pages of your local telephone book or in Thomas' Register for your nearby Carboloy Distributor. He has complete local stocks and services. Ask him about the MTI Plan.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company.

Send coupon—pinned to your company letterhead—for your free MTI Plan Kit

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

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- ☐ Please rush me, at no cost or obligation, MTI Plan Kit
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- ☐ Send me the new, free Brief-A-Log GT-265, containing complete specifications and prices of Standard Carboloy Tools and Blanks

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ACE NYLON BALLS

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fabricated of DUPONT NYLON FM No. 10001 to close tolerances

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HEAVY-DUTY Air-Cooled ENGINE POWER at its Best!

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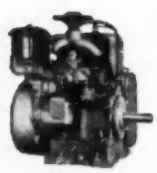
They base their selections of engines on such factors as heavy-duty construction, low-cost operation and maintenance, Air-Cooling that provides trouble-free service in all locations, easy starting, and readily available replacement parts when needed, through a reliable source.

Wisconsin Motor Corporation is the world's largest manufacturer of Heavy-Duty Air-Cooled Engines, from 3 to 36 horsepower, in 4-cycle single cylinder, 2- and 4-cylinder types. Here is dependable power to *fit the machine* and *fit the work* for which the machine is designed.

4-cycle single cylinder 3 to 9 hp.


2-cylinder 7 to 14½ hp.

V-type 4-cylinder 15 to 36 hp.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

A 7516-½-A

AIRBRIEFS

(*Continued from page* 156)

having an airframe weight of 40 million lb; during 1952 a total of 6793 planes was produced with an airframe weight of 88 million lb. In December, 1950, the industry produced 150 Air Force and 78 Navy airplanes; in December, 1952, deliveries had increased to 670 airplanes for the Air Force and 243 for the Navy; and in March, 1953, the industry delivered 719 Air Force and 264 Navy airplanes.

Civil Output

Latest production figures for civil aircraft (both large airline transports and small utility types) for the month of May show that 417 airplanes were delivered. This is a continuation of the steady increase shown this year. These aircraft were valued at $24,445,000 and engine shipments during the month aggregated $12,473,000. Significantly, the airplane backlog continued to decline with only 394 airplanes of all types now on order. This trend is a continuation of the "catching up" phase of the civil industry since the first of the year.

Airline Record Year

U. S. airlines are smashing all records this year for passenger traffic with volume already running 25 per cent ahead of last year's record totals. Current airline volume is twice that of three years ago. Although domestic travel is showing the largest gain, international passenger volume is up 17 per cent over last year. Even more important is the fact that this heavy increase in volume is being handled more efficiently and airline revenues are up a whopping 67 per cent over last year. Observers predict, however, that year-end totals will not show such an amazing increase in profits due to the fact that a major share of this new business is in low-profit air coach travel. Last year air coach accounted for only about 20 per cent of total airline travel, but indications are that this proportion will rise to about one-third of all passenger-miles this year.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

Work heavy, bulky, hard to move?

Bring the tool to the work...

with Black & Decker Sanders and Grinders!

They're powerful and portable!

NO MATTER how big or bulky your abrasive jobs, you'll cut costs and speed up work when you switch from hand methods to Black & Decker power! B&D Sanders drive abrasive discs, saucer grinding wheels, "Whirlwind" wire cup brushes, gouging and planing heads. B&D Portable Grinders drive grinding wheels, "Whirlwind" wire wheel brushes, cotton buffing wheels. And *both* give you: (1) Dependable, full-powered motors tailor-made by Black & Decker for the tools they drive; (2) Perfect balance for easy handling, less operator fatigue; (3) Tough, longer-lasting parts for extra years of service, lower tooling costs!

See your nearby B&D Distributor for demonstrations, expert help on any tooling problem. Write for free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. Co., 606 Pennsylvania Ave., Towson 4, Maryland.

BD Black & Decker PORTABLE ELECTRIC TOOLS

DRILLS

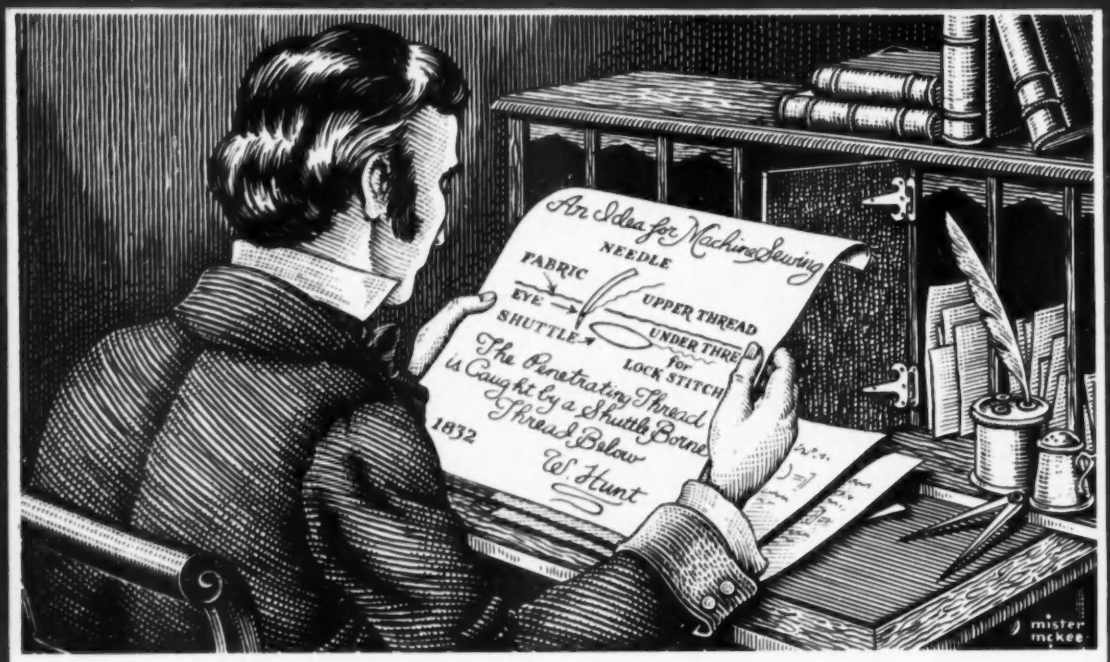
ELECTRIC HAMMERS

BENCH GRINDERS

SCREW DRIVERS

SAWS

PORTO-SHEARS



Two Million Dollars for a Needle

Sewing is probably as old as mankind, but not until the year 1832 did the hole move to the point of the needle, so that machine sewing became possible. Walter Hunt of New York City had this great idea, combining with it the shuttle-carried lock-stitching thread on the underside of the fabric.

Elias Howe usually gets credit for inventing the sewing machine, but actually he worked out the idea twelve years after Hunt. Howe, you see, had the good sense to patent the idea. It brought him over two million dollars.

It's great to have an idea. It's much more wonderful to make it work. That's where we come in.

Often difficult and unusual problems are involved in operating mechanisms that depend on *pliable parts*. These must be *composed* and *designed* for continuous dependable service under a wide variety of environment and operating conditions, often in the presence of deteriorative materials or conditions.

For such critical parts, perhaps the most versatile and reliable material ever developed is SIRVENE. This is an oil-resistant elastomer (loosely called synthetic rubber) *compounded in formula* as will best meet the specific need.

SIRVENE engineers are constantly working on pliable part problems, in scores of fields. They are constantly developing new SIRVENE compounds. And when design and compositions are determined, C/R quantity production takes over, operating at laboratory-quality level.

Let SIRVENE engineers work with you from the inception of your idea for a new product. They can short-cut your work, protect you in advance against disappointment.

"Engineering with Sirvene" will be sent with our compliments if you request it. It belongs in your files.

Sirvene products include diaphragms, boots, gaskets, oil seals, washers, packings and similar molded parts.

CHICAGO RAWHIDE MANUFACTURING CO.

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75 C/R

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SCIENTIFICALLY COMPOUNDED ELASTOMERS

Sirvis
MECHANICAL LEATHER PRODUCTS

Boots, diaphragms, packings and other products that give dependable service under difficult operating conditions.

Perfect Oil Seals

More automobiles, farm and industrial machines rely on C/R Oil Seals than on any similar sealing device.

Representatives in these Principal Cities

Boston • New York • Syracuse • Buffalo • Philadelphia
Pittsburgh • Cincinnati • Cleveland • Detroit • Peoria
Minneapolis • Wichita • Houston • Los Angeles
San Francisco

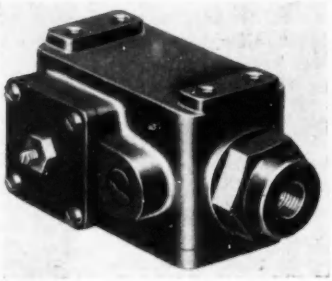
New Products

For additional information please use postage-free reply card on page 73

(*Continued from page* 72)

Pressure Regulator

Now on the market is Model 10700 pressure reducing regulator for air or oxygen systems. Weighing eight oz and measuring 1⅝ in. by 1 15/16 in. by 2 21/32 in., it is said to take inlet pressures up to 2000 psi., have adjustable output pressure from 50 to 300 psi and handle flows up to 300 liters per minute.



Output pressure variation from zero to full flow is approximately 15 per cent. Regulators reportedly will handle larger than 300 liters per minute flow if pressure drop from zero to full flow is allowed to drop more than 15 per cent. *The Aro Equipment Corp.*

Circle 41 on page 73 for more data

Stainless Alloy

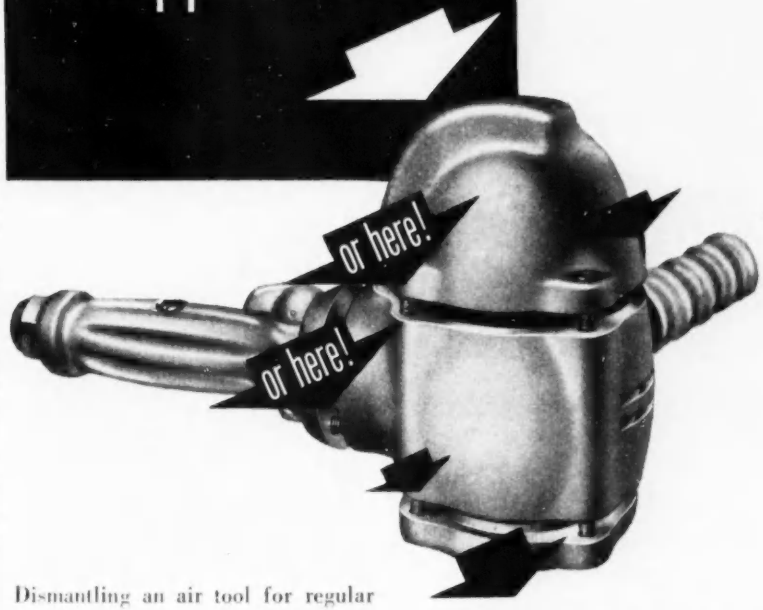
Recently announced is a stainless alloy, called V2B, that is said to combine high hardness, non-galling characteristics, and good corrosion resistance. It is a hardenable type stainless steel which contains, in addition to chromium and nickel, appreciable percentages of copper, molybdenum, silicon, and a small amount of beryllium.

The alloy is reportedly readily machinable in the quench-annealed state and may be hardered by a low-temperature heat treatment which produces no distortion. It is claimed that the material may be easily welded in the annealed condition by the use of special welding rods. *The Cooper Alloy Foundry Co.*

Circle 42 on page 73 for more data

(*Turn to page* 164, *please*)

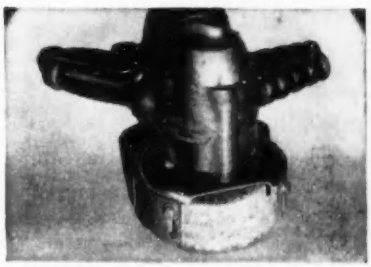
it can't happen here!



Dismantling an air tool for regular inspection and maintenance is one way to insure better air tool performance.

Unfortunately, it's also one way to wear out or strip threads in tool housings—and that means re-tapping the holes and using oversize screws, which adds to tool maintenance time and costs.

Fortunately, this can't happen to you—if you're using Buckeye tools—because every threaded hole in Buckeye tool housings has a *replaceable* Heli-Coil insert. That means you always drive screws into a hardened steel thread—so you can't wear or strip threads in the housing—ever.



This, and many other exclusive Buckeye Tools features are completely described in our Air Tools and Electric Tools catalogs. Write for one, or both, today.

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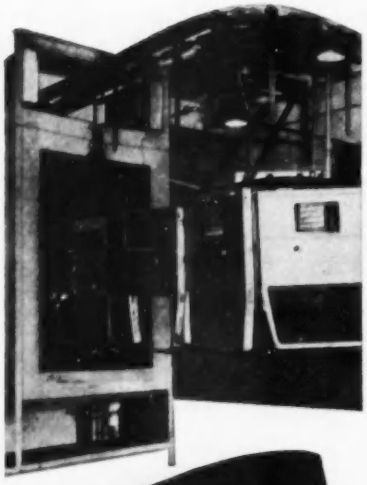
Buckeye Tools CORPORATION

DIVISION 21 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario



METALWASH AT AUTOCAR

Illustration shows cab doors for Autocar trucks being cleaned, phosphate coated, and dried.

This METALWASH phosphate coating machine provides an ideal surface for a lasting paint finish on truck chassis and sheet metal parts.

Cleaning and phosphating are uniform since the cycle is automatically controlled. Continuous operation, built around the conveyor line, eliminates material handling problems.

Metalwash Finishing Engineer, published quarterly, is available on request to engineers and executives to whom cleaning and finishing are operations of interest.

Write on your company letterhead for your free copy.

METALWASH
MACHINERY CORPORATION

924 North Ave., Elizabeth 4, N. J.
Representatives in principal cities

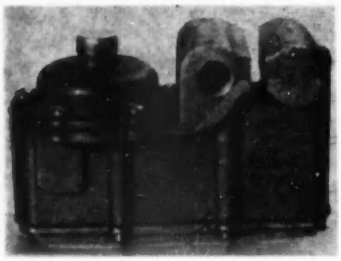
New Products

For additional information please use postage-free reply card on page 73

(*Continued from page* 163)

Fuel Pressure Regulator

Model R-77 fuel pressure regulator, now available, has new-type inlet and outlet ports which are said to increase operating efficiency. Other important benefits claimed are: reduction of engine and carburetor needle and valve wear; elimination of percolation; no flooding of carburetor due to high fuel pressures; and prevention of vapor-lock.



The unit reportedly cuts down gasoline consumption by making the flow uniform when it enters the carburetor. *Schneider Carburetor Co.*

Circle 43 on page 73 for more data

Surface Coating

Recently developed is a resin surface coating, designated as Type X-5, that is said to have good properties of adhesion to various metal surfaces.

Applied from solution, it reportedly develops a thin black coating ½ to one mil in thickness. After baking for an hour or more at 330 F. or several minutes at 500 F., the coating shows excellent adhesion to clean metal surfaces, according to the manufacturer. *Furane Plastics, Inc.*

Circle 44 on page 73 for more data

(*Turn to page* 166, *please*)

Classified Advertisement

LINES WANTED—Manufacturers representative needs additional lines. Complete coverage automotive jobbers, chains, etc. Penna., Md., Del., and D. C. Box No. 72, Automotive Industries, Chestnut & 56th Sts., Philadelphia 39, Pa.

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Precision Cap Screws

● Wherever shear, stress or vibration is encountered, **CHANDLER** cold forged metal fasteners assure perfect performance. Uniformly accurate, they speed assembly operations.

The quality and precision of **CHANDLER** cap screws can be measured by their wide use in major industries. **CHANDLER** fasteners are used by leading manufacturers of gasoline, jet and diesel engines designed for automobiles, aircraft and heavy equipment.

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there's a new look in finishes, too!

Let your mind wander . . . to new depths of color in metallic automotive paints . . . to the rich iridescence of finishes you *look into, not at* . . . to finishes that are smooth, flint-hard and clean, sparkling with character.

Alcoa has developed a new aluminum tinting paste to help you explore new polychrome effects. We call it our No. 1595 Albron® Tinting Paste. Complementing our popular No. 222 paste, it is extra fine in composition, rigidly controlled in a selected pattern of particle size-range. Easy to blend and retentive in brightness, it widens the color horizon for development of new glamour tones.

Leading manufacturers of automotive finishes have products made with Alcoa® Aluminum Tinting Paste No. 1595 in stock *right now*. Ask your supplier about them, or call us for any assistance you may need in your metallic finishing problems. Our complete facilities are as close as your phone. Or write: ALUMINUM COMPANY OF AMERICA, 1951-H Alcoa Building, Pittsburgh 19, Pennsylvania.

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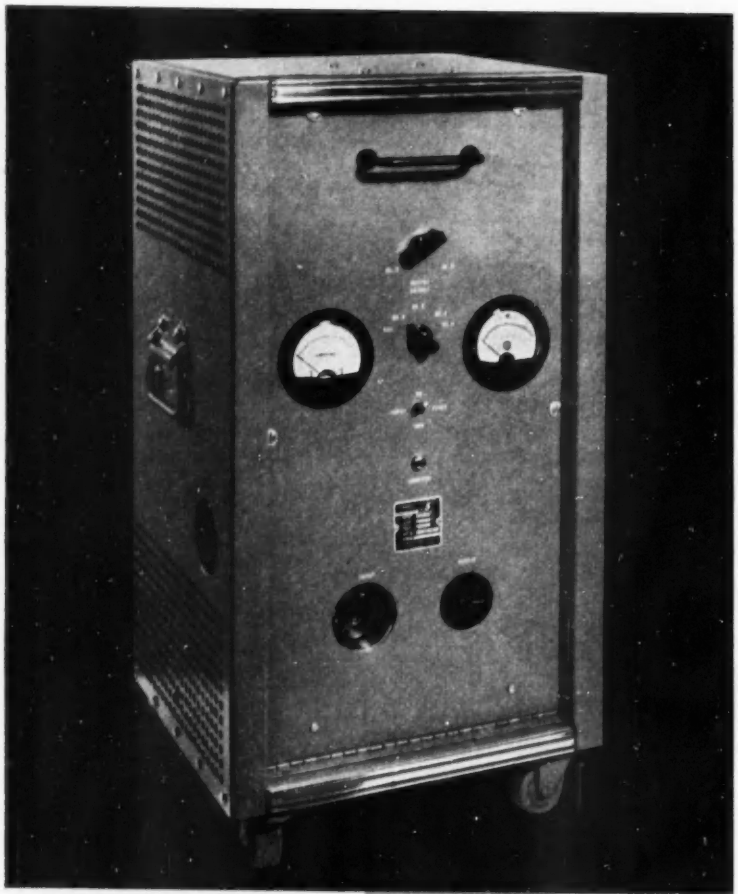

TUBELESS MAGNETIC AMPLIFIER DC SUPPLIES

for Automotive and Aircraft Industries

Sorensen Nobatrons Model MA6/15 and Model MA2850 are tubeless — using magnetic amplifier principles. They have plenty of current capacity — 100 amps at 6 volts or 75 amps at 12 volts in the MA6/15 and 50 amps at 28 volts in the MA2850. Please see the specs below.

The MA6/15 is designed primarily as an automotive production test instrument for use in checking window motors, heaters, clocks, radios, headlight dimmers, ignition systems, air conditioners, cigarette lighters. The MA2850 can be used for testing aircraft heaters, pitch changers, inverters, radar, fire control systems, etc. Built around tubeless circuits, both models are carefully engineered and built to give you years of trouble-free, dependable service. Write for information now!

SPECIFICATIONS

Model MA2850

Input voltage range	190-230, 3φ, 4 wire, 60 ~
Output	28 volts DC, adjustable between 23 and 34 volts
Current	0 - 50 amperes
Ripple	3% max RMS
Regulation accuracy	±1% against line and load combined
Time constant	0.5 seconds under worst conditions
Dimensions	15½" wide x 25⅜" high x 13" deep

Meters are standard.
Units are self contained.

Model MA6/15

Input voltage range	210-250 VAC, 1φ, 60 ~
Output	Adjustable 6 - 7.7 volts DC from 0-100 amperes Adjustable 12 - 15.4 volts DC from 0-75 amperes
Ripple	1% max RMS
Regulation accuracy	±1% against line and load combined
Time constant	0.2 seconds under worst conditions
Dimensions	21" wide x 36" high x 15" deep

Meters are standard. Cabinets optional.

SORENSEN

SORENSEN AND COMPANY • 375 FAIRFIELD AVE., STAMFORD 9, CONN.

New Products

For additional information please use postage-free reply card on page 73

(*Continued from page* 164)

Steam Hose Line

Recently introduced is a burst-proof steam hose line constructed of a natural rubber inner tube reinforced with either one or two plies of high tensile steel wire braid, depending on the hose size. An asbestos braid is applied over the wire braid reinforcement. The outer cover consists of an oil resistant butyl rubber cover.

A principal feature of the unit is the Little Gem fitting that is said to assure positive attachment to the hose without the need for periodic adjustments. The lines are currently being produced in ½, ¾ and one-in. sizes. *Aeroquip Corp.*

Circle 45 on page 73 for more data

Magnesium Coating

Now available is a process for the protective coating of magnesium alloys by anodic oxidation. Known as No. 17 Anodize, it is said to produce an abrasion-resistant coating and reportedly can be applied to all of the standard alloys as well as to unalloyed magnesium.

The coating is a refractory ceramic type that is reputed to withstand heating to the melting point of the base metal without decomposition. In addition, the company states that it provides a good base for supplementary oil, wax, and paint coatings. *Dow Chemical Co.*

Circle 46 on page 73 for more data

Pressure Charger

Recently announced is an air-operated, automatic pressure charger to be used in conjunction with piped high-pressure lubrication systems.

In operation, the device reportedly will provide instantly 6000 lb of lubricant pressure at the control valve, when used with 125 lb or more of air pressure and as long as the supply pump delivers lubricant to it. The unit may be used with a hose reel or with the delivery hose connected directly to the outlet. *Alemite Div., Stewart-Warner Corp.*

Circle 47 on page 73 for more data

NATIONAL OIL SEAL LOGBOOK

Write our Redwood City office for reprints of this Logbook page

Sealing News & Tips

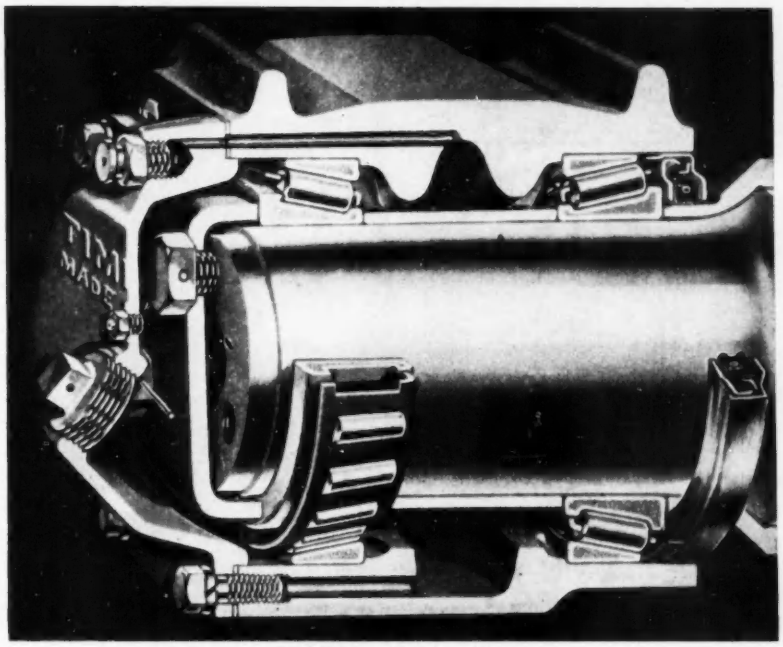

Fig. 1. Timken railway journal box

Special convoluted dual lip Syntech* seal designed for Timken railway roller bearing

Timken cartridge-type journal boxes for roller freight cars (Figure 1) employ a National Syntech seal to retain light bearing grease and exclude dirt, dust and water. This seal (Figure 2) has a convoluted sealing member of National Syntech (synthetic rubber), incorporating two opposed sealing lips tensioned by a middle-positioned spring. This design, plus the natural flex action of Syntech, insures uniform sealing under all operating conditions.

For maximum rigidity, durability and dimensional uniformity, the sealing lip is bonded to a steel member and assembled within a steel outer case. The case press fits into the Timken cartridge housing. A special requirement of the application is that the outer sealing lip must run dry on a 6.3" shaft, at speeds up to 1,000 r.p.m. A modified Syntech compound proves satisfactory for this demanding application.

National seals used in Timken railway bearing applications are specially designed to meet special conditions. In many sealing applications, however, one of 2,500 standard-design National Oil Seals can often be utilized. In either case, National Applications Engineers are at your service. Their special skills are backed up by the world's largest manufacturing facilities devoted exclusively to seals and 30 years of practical sealing experience.

Fig. 2. National Syntech Seal

*T.M. Reg.

National 50,000-S Syntech Seal

Standard-design National seal capable of continuous operation with zero leakage at intermittent temperatures to 300° F., speeds to 3,600 F.P.M., runout to .030 indicator. Precision-trimmed synthetic rubber sealing member is unaffected by water and most lubricants, detergents or industrial fluids.

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Complete line of quality, precision-made commercial grade O-Rings. Get factory-direct engineering, sales service from the National Applications Engineer nearest you or write direct for new O-Ring Catalog. It includes engineering, design and performance information, gland groove and back-up ring requirements. Request free copy on your letterhead, giving your name and title.

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OIL & GREASE SEALS
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Let's use FRONTIER 40-E

Aluminum Alloy...

. . . it's a combination of HIGH YIELD STRENGTH RESISTANCE TO SHOCK and REQUIRES NO HEAT TREATMENT!"

Jim: Say, that sounds like an alloy that ought to do the trick. The production jobs we've got require lapping and close tolerance machining operations.

J.D.: FRONTIER 40-E will do just that! There's no tearing effect of cutting tools and we can be sure of getting a smoothly finished surface.

Jim: I know it can be readily reamed or tapped. But what about pressure tightness and corrosion resistance?

J.D.: Castings of ½" to 1" wall thicknesses withstood pressures up to *400 pounds per square inch* with no evidence of porosity or cracking. Corrosion resistance is excellent, even under stress.

Jim: I've seen truck axles, stress parts in planes and lots of other applications where FRONTIER 40-E was used with substantial weight reductions... and yet all-important product strength was *increased.*

J.D.: You can't beat FRONTIER 40-E castings for the important physical properties needed in applications throughout every industry. Better get on the phone and order our FRONTIER 40-E right away, Jim.

WRITE for your copy of the FREE ALLOY DATA book that will give you the full story on how 40-E can work with profit — for you.

Remember — if aluminum can do it *better* — FRONTIER 40-E Aluminum Alloy can do it *best!*

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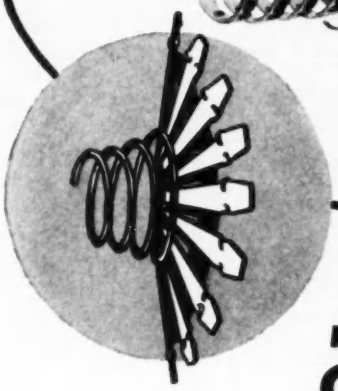
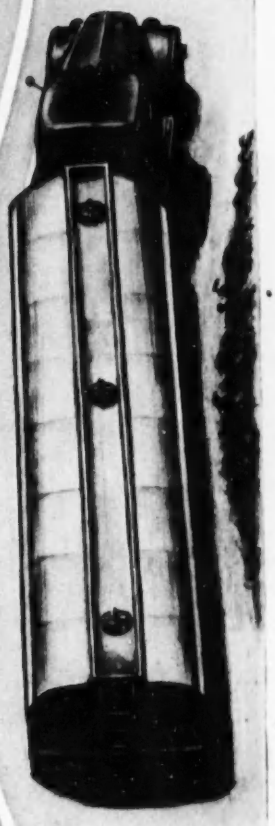
the SOFT Acting CLUTCH with the *Sure Grip*

...Just like a hand of Steel in a Velvet Glove

The hand of steel in the Lipe Clutch has 20 fingers that equalize the pressure of a single spring—assuring softer engagement and a positive grip.





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Lipe's soft engagement, positive grip Multi-Lever Clutch never needs babying. It engages smoothly—without grab, shock or jerk. All parts of the pressure plate touch at the same instant with the same pressure. No cocking—no point of high slippage and spot burning.

Result: More mileage between tear-downs.

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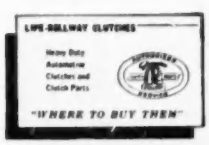

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Manufacturers of Automotive Clutches and Machine Tools

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OSBORN

14 minutes by hand . . .
Now 3 minutes with push-button brushing

This strip act with Osborn wire brushes is taking off costly hours in the production of d-c motor armatures . . . typical of savings being discovered throughout industry with push-button brushing methods.

The job here is to remove enamel insulation from copper wires to assure top quality soldered connections. Formerly done by a tedious hand-scraping method, the time per armature was 14½ minutes. With the motor-driven brushing device shown the time has been cut to 3 minutes. As the armature is turned, a pair of Osborn Disc Center wire brush heads rotate downward on the wires and the insulation comes off clean.

This is typical of thousands of production jobs which have been simplified with the help of the **O**sborn **B**rushing **A**nalyst. For help to improve *your* cleaning, finishing or deburring operations, call your **OBA** or write *The Osborn Manufacturing Company, Dept. E-8, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

FREE: New booklet on deburring with Osborn Power Brushing. Write for your copy.

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

Why the leaders prefer

PUROLATOR
FULL-FLOW
MICRONIC FILTERS

✓ **Full-flow rates within practical filter dimensions:** The famous "accordion-pleated" Micronic* filter element has up to ten times more filtering area than old-style filters—gives high flow rates in a minimum of space.

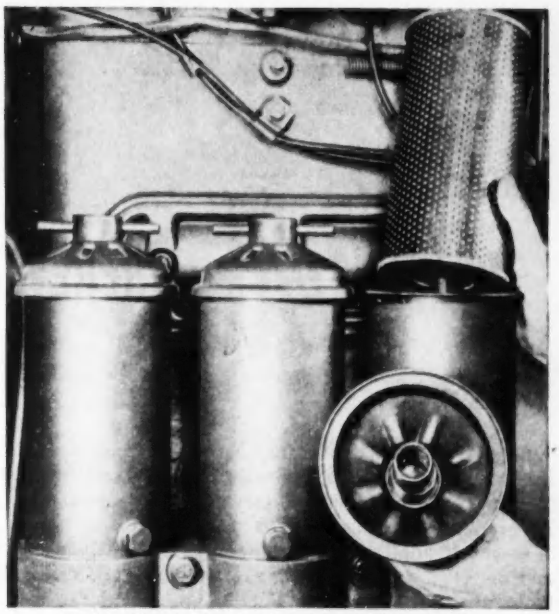
✓ **Ultra-micronic filtration:** High flow rates are, of course, meaningless unless effective filtration is maintained, too. Electron micrographs prove that the Purolator* Micronic filter stops particles down to *submicrons*—.0000039 in.!

✓ **Maximum dirt storage capacity:** The pleated design of the Micronic filter element provides many times more dirt storage space than old-style filters. This important advantage means uniform, efficient performance and a lengthy service life.

✓ **Minimum pressure drop:** The Purolator Micronic filter element introduces a remarkably small pressure drop in the lubricating system . . . permitting pumps of practical size and simple type.

✓ **Will not remove or absorb additives:** With Purolator Micronic filtration, you keep *all* the oil quality you pay for. The Micronic filter element will not strip additives . . . an important advantage with modern HD and heat-resistant oils.

*Reg. U. S. Pat. Off.



Purolator Micronic Filters in a typical Diesel full-flow installation. Although the Purolator Micronic filter elements measure only 4½ in. by 9 in., each one filters 9 gallons of oil per minute, giving a total of 27 g.p.m. for the complete filter unit.

THE advantages of Purolator Full-Flow Micronic filtration—wherein *all* the oil is filtered *each time* it passes through the engine—have been dramatically demonstrated during the past few years. In some instances engine life has been increased by thousands of hours, bearing and ring wear has been reduced to almost imperceptible minimums, and engines have been made to operate efficiently where air-borne abrasives formerly destroyed them in a matter of hours. One after the other, leading makers of Diesel and gasoline engines and vehicles are adopting full-flow lubrication . . . and standardizing on Purolator Full-Flow Micronic filters. In some fields, manufacturers are finding that full-flow lubrication is becoming a necessary feature to maintain a competitive sales position.

Time and again, in impartial tests conducted by vehicle and engine manufacturers themselves, Purolator Micronic filters have been proved best on all counts . . . fineness of filtration, long service life, ease of servicing.

Our Engineering Department will gladly co-operate in helping you prove—*in your own way, on your own equipment*—that there is no finer filter made than Purolator. Simply write, describing your equipment and filter requirements.

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Rahway, New Jersey, and Toronto, Ontario, Canada
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PUROLATOR
MICRONIC OIL FILTER
"FIRST IN THE FIELD OF FILTERING"

Janitrol

PUTS *heat* WHEREVER YOU WANT IT

Whenever a hot aircraft story breaks, chances are that Janitrol is in the picture. For one thing, Janitrol makes a complete line for commercial and military aircraft, ground vehicles and stationary engines. Janitrol portable heaters, now serving in scores of applications for engine warmup, shelter heating, etc., incorporate the same time-proven dependability of Janitrol aircraft heaters. And rounding out the line are Janitrol liquid heaters, whose performance on tow tugs, fire-fighting crash trucks, fuel trucks, and diesel transit coaches points to new applications on a wide range of diesel or gasoline engine powered equipment . . . Whether you build, operate, or maintain equipment that calls for heat, call in your nearest Janitrol representative. He's a good man to know.

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Cold Finished

CARBON AND ALLOY STEEL BARS

Uniformly satisfactory in service because—

Machinability is outstanding

Tolerances are uniformly close

Metallurgical characteristics are rigidly controlled

QUALITY V YOUNGSTOWN SERVICE

OF PRODUCING STEEL

●Here's why the bars you get from Youngstown will meet your exact requirements. They're drawn from steel produced by an organization that's been making and rolling highest quality steel for 50 years.

Youngstown Cold Finished Carbon and Alloy Steel Bars are furnished in standard shapes and sizes, in both coils and straight lengths. For further information, phone or write our nearest District Sales Office.

Youngstown

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When it comes to cooling, come to Harrison!

In arriving at the solution to problems of automotive cooling, there is no substitute for experience. And Harrison has been designing and manufacturing automotive radiators for forty-two years.

With the experience gained through the production of more than fifty-three million radiators, Harrison is eminently qualified to handle your cooling problems. Our engineering staff and our modern testing facilities are at your service.

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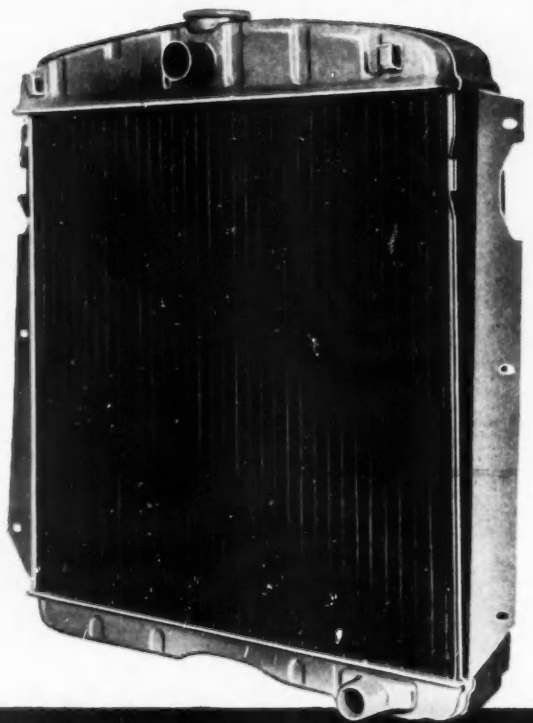

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RADIATOR
DIVISION

GENERAL MOTORS CORPORATION
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You don't need to invest in expensive cutting equipment !

WHEN YOU BUY STEEL FROM WAREHOUSE YOU GET:

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- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

TYING up money in large, expensive steel-cutting machinery is something you can avoid, if you wish. Yet you can have your cutting done on the most modern equipment available. When you order your steel from U.S. Steel Supply, specify just how you want it cut. We will meet these specifications exactly. For example, our flame cutting equipment will follow the most complicated patterns without error and turn out finished shapes precisely as you want them. Your U.S. Steel Supply salesman will give you complete information about our cutting services.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

Same as PUTTING MONEY IN THE BANK!

Standard X-WASHERS

Save

- PRODUCTION TIME
- PRODUCTION COSTS
- PRODUCTION FAILURES

FREDD'S FASTENER TALKIN': We can provide grooved pins for all sizes of STANDARD X-WASHERS... parallel or headed type pins made to specifications. Send print... or write for X-WASHER catalog and order by number. You'll receive a prompt quotation.

● Designers of products ranging from wheel chairs to airplanes rely on STANDARD X-WASHERS . . . the *profitable* solution to almost every fastener problem.

This simple locking device is inexpensive, safe, and efficient. Especially designed to hold pins and small shafts firmly in position, the STANDARD X-WASHER completely eliminates the need for outmoded castellated nuts, cotter pins, and lockwire. No *special* tools are required. A pair of ordinary pliers clamps the STANDARD X-WASHER to a tight 360° enclosure in a jiffy, speeding up the work on the assembly line.

For the *complete* story on the new-type fastener with the thousand and one applications, send for the illustrated STANDARD X-WASHER catalog. Start saving money for your company by "designing-in" STANDARD X-WASHERS.

STANDARD Locknut and Lockwasher, Inc.
2250-56 VALLEY AVE. • INDIANAPOLIS 18, INDIANA

NOW... replace dull tools without halting production!

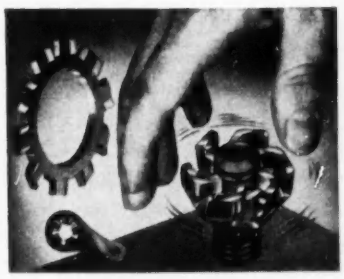
AMF WAHLSTROM Instant-Change Chucks provide the Automotive Industry a unique way to save time!

Drills, reamers and similar tools are removed and replaced *instantly* ...without keys, collets or wrenches...without even slowing the spindle—thanks to the AMF Wahlstrom Instant-Change Chuck.

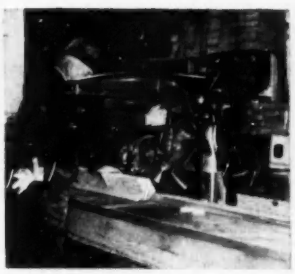
A slight hand pressure causes the powerful, self-centering jaws to release the tool, or lock it in place. And this unique chuck cannot chew up shanks; so tools *last longer* and continue to do precision work.

The AMF Wahlstrom Fully-Automatic, Instant-Change Chuck has been widely used for years on drill presses, boring mills, milling machines and lathes, permitting a single spindle to perform a wide variety of consecutive operations. The Automotive Industry, however, was first to appreciate its time-saving possibilities in replacing dull tools on large-scale operations.

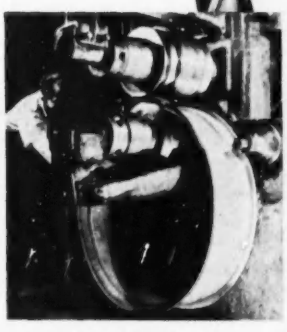
This is but one example of how engineering ingenuity and AMF products help the Automotive Industry produce *better* products...faster...at lower cost! Others are illustrated below. Your inquiries are invited.
Address: American Machine & Foundry Company, General Products Group, 511 Fifth Avenue, New York 17, N.Y.



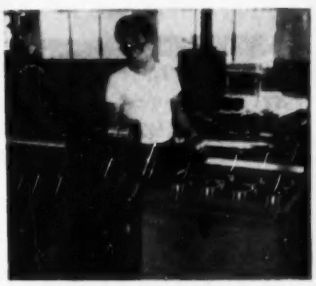
ASSEMBLY IS SPEEDED by AMF's Thompson-Bremer *Everlock*® self-locking nuts, tooth-type lock washers and sems.



SHIPPING AND MAINTENANCE departments find AMF De Walt® Power Saws save time in all wood-cutting operations.



MAJOR SUPPLIER of rims and circular weldments for the Automotive Industry is AMF's Cleveland Welding Company.



AMF INDUSTRIAL LOWERATOR® DISPENSERS store and position planned quantities of parts in process at efficient working levels.

amf products ARE BETTER...*by design*

AMERICAN MACHINE & FOUNDRY COMPANY

®Registered Trademark

94.9% of Lockheed's 50,000 employees are enrolled in the Payroll Savings Plan

ROBERT E. GROSS

President, Lockheed Aircraft Corporation

National Chairman, 1953 Aircraft
Industry Payroll Savings Drive

"A man's personal economic security is the sum of his own diligent effort, a financially sound government and a systematic savings plan. He has the earnings and he has the government that can protect the individual. However, human nature being what it is, not everyone maintains a systematic plan of savings. So here is a plan designed to help the employee—the Payroll Savings Plan, whereby his company will regularly invest a part of his earnings (he specifies the amount) in United States Savings Bonds, America's safest form of investment. We at Lockheed have endorsed and encouraged this plan because we know what it does to assure security—both individual and national."

Lockheed Aircraft Corporation recently conducted a person-to-person canvass that put a Payroll Savings Application Blank in the hands of every employee of Lockheed's eleven plants in Southern California. At the conclusion of this one-week campaign, 36,419 of the 38,037 employees—95.7%—had signed up on the Payroll Savings Plan. Three of the eleven plants achieved 100% enrollment.

Lockheed's 95.7% in the Southern California plants is the highest employee participation of any company or group of this size this year. The previous national record in the aviation industry—92%—was set by Lockheed's Georgia Division in April, 1953. Of Lockheed's total payroll—50,000 men and women—94.9% are building ". . . security—both individual and national" by systematic investment in U.S. Savings Bonds.

45,000 companies operate Payroll Savings Plans. In many of these companies employee participation ranges from 60% to 80%; in some, it is even higher. On the basis of Payroll Savings Records, it is safe to estimate that 60% or more of the personnel of a company will join the Payroll Savings Plan—

—if the many personal benefits of the Payroll Savings Plan are properly presented to them by management.

—if they are shown how their monthly investment in Savings Bonds contributes to national stability by adding to our reservoir of future purchasing power—$35.5 billion—the cash value of outstanding Series E Bonds—the kind purchased by Payroll Savers.

Your State Director, U.S. Treasury Department, is ready to help you build a 60%, 70% or 80% Payroll Savings Plan. He'll explain how easy it is to conduct a simple person-to-person canvass and will furnish all the printed matter, posters, etc. Phone, wire or write today to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D.C.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

AUTOMOTIVE INDUSTRIES

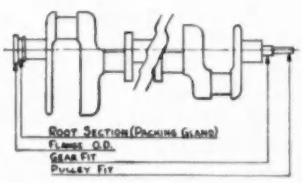
Salvage of rejects speeded by new metallizing alloy

outwears old bearing material 25 times

Automotive manufacturers replace chrome plating installation with metallizing for salvage of mis-machined crankshafts; step up output to 10 per hour

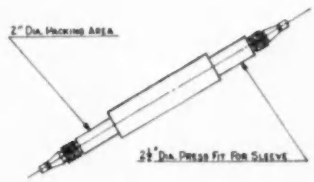
Sprabond Wire, the new self-bonding metallizing alloy, is speeding reject salvage in a wide range of production applications. It has been found particularly valuable in building up parts which have been machined undersize, or damaged by tool marks. Resulting surfaces are extremely hard and, due to their microscopic pore structure, tend to hold considerable amounts of oil. These factors produce excellent wear characteristics, some users reporting increases in service life as much as 25 times that obtained in any other way.

Application is simple and fast; only 3 operations: (1) the part is cleaned or undercut; (2) Sprabond Wire applied; (3) the surface finish-ground. Dovetailing and undercutting often not required and build-up can be carried to a feather edge. No danger of warpage because negligible heat is generated in the part during spraying.



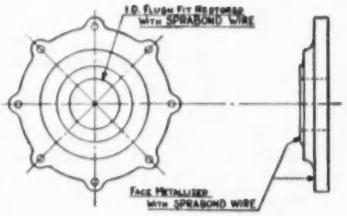
Better and faster than plating

Sketch shows automotive crankshaft of the type being reclaimed in quantity by large manufacturer. These parts were formerly reclaimed by plating, which was slow and expensive. With metallizing, however, production rate is 10 shafts per hour.



Where welding is impractical

Heat warping and consequent straightening costs made welding impractical for salvage of blower shafts such as shown above. Shafts formerly scrapped and replaced are now rebuilt. With Sprabond Wire metallizing, saving is $45.00 each.

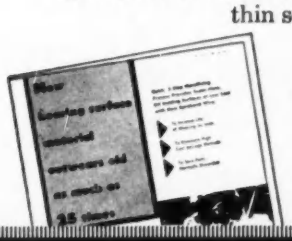


Fits restored—no re-machining

Press fit in electric motor end bell is frequently lost through wear. Welding is impractical here, too, because of warpage. But a few thousandths of Sprabond Wire on the I.D. builds a press fit so that even minimum grinding is often unnecessary. Savings per end bell—about $30.00.

Some other money-saving applications for the Sprabond Wire process

Cracked blocks and castings — flat surfaces — molds, patterns, match plates — sand holes thin sections — lathe ways—inside diameters — gas holes.



FREE Metco Bulletin 57B describes the advantages of the Sprabond Wire metallizing process in detail. Micro-photograph of Sprabond Wire coating on steel shows how it works. Use the coupon to send for your free copy today. No obligation, of course.

METALLIZING ENGINEERING CO., INC.

38-24 30TH STREET — LONG ISLAND CITY 1, N. Y.

In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. Chobham near Woking, England

The following trade names are the property of Metallizing Engineering Co., Inc.: METCO*, SPRABOND WIRE. *Reg. U. S. Pat. Off.

Don I. Watson
Metallizing Engineering Co., Inc.
38-24 30th St., Long Island City 1, New York

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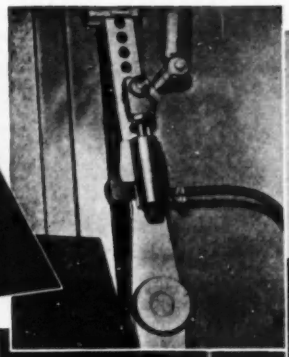
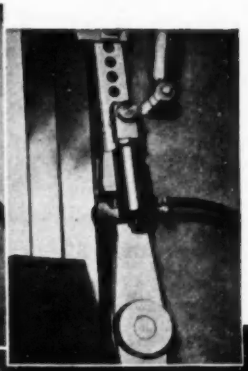
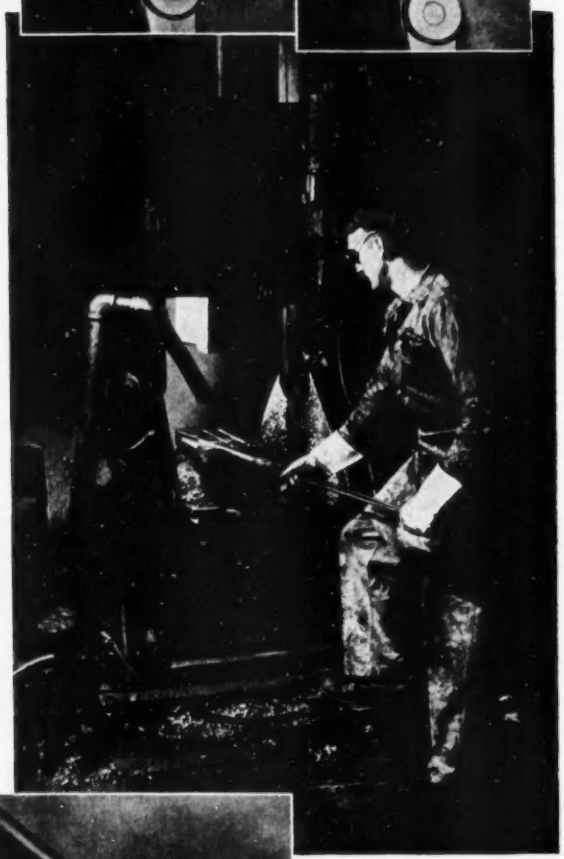
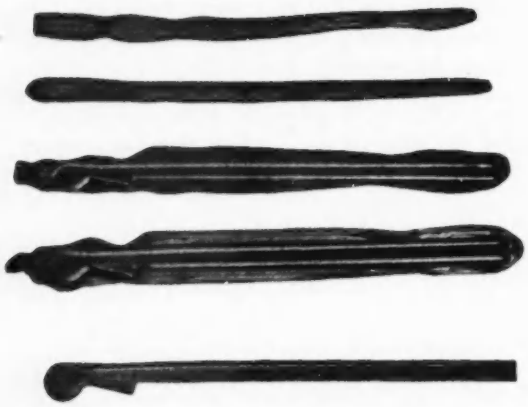
CECO-DROP SHORT STROKE CONTROL

"Makes the Hammer Talk!"





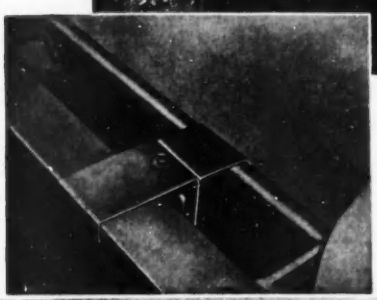




An installation of a Short Stroke Control on a 2500 lb. CHAMBERSBURG CECO-DROP HAMMER is shown, forging steel ankle joints for leg braces. Above are samples of the forging as it appears during various stages. The forging process begins with a series of 20 to 23 short, rapid blows (about 18" stroke) to draw the 2½" dia. stock. This is followed by two long blows (about 38" stroke) to roll it, three more long blows in the rough impression, and three more long blows to complete the forging. After the last blow the ram is stopped on the up-stroke at the "short blow" position for the next forging.

Short Stroke Control is but one of the many features of Chambersburg CECO-DROPS. These piston lift, gravity drop hammers are setting new standards in forge shop production. Lower operating costs, minimum down time, easy operation, wide range of operations, extra safety; all add up to "more forging per hour" the basis on which to judge the efficiency of a Drop Hammer. Write for Bulletin 11-L-0.

CHAMBERSBURG ENGINEERING COMPANY
CHAMBERSBURG, PA.



(Above right) Dog in full stroke Position. Wedge is lifted, Short Stroke Control is inoperative.

(Above left) Dog in Short Stroke Position. Wedge is down, holding dog in operating position.

(Lower left) Button on treadle when depressed by operator shortens the stroke. Release reverts to full stroke.

CHAMBERSBURG

THE HAMMER BUILDERS

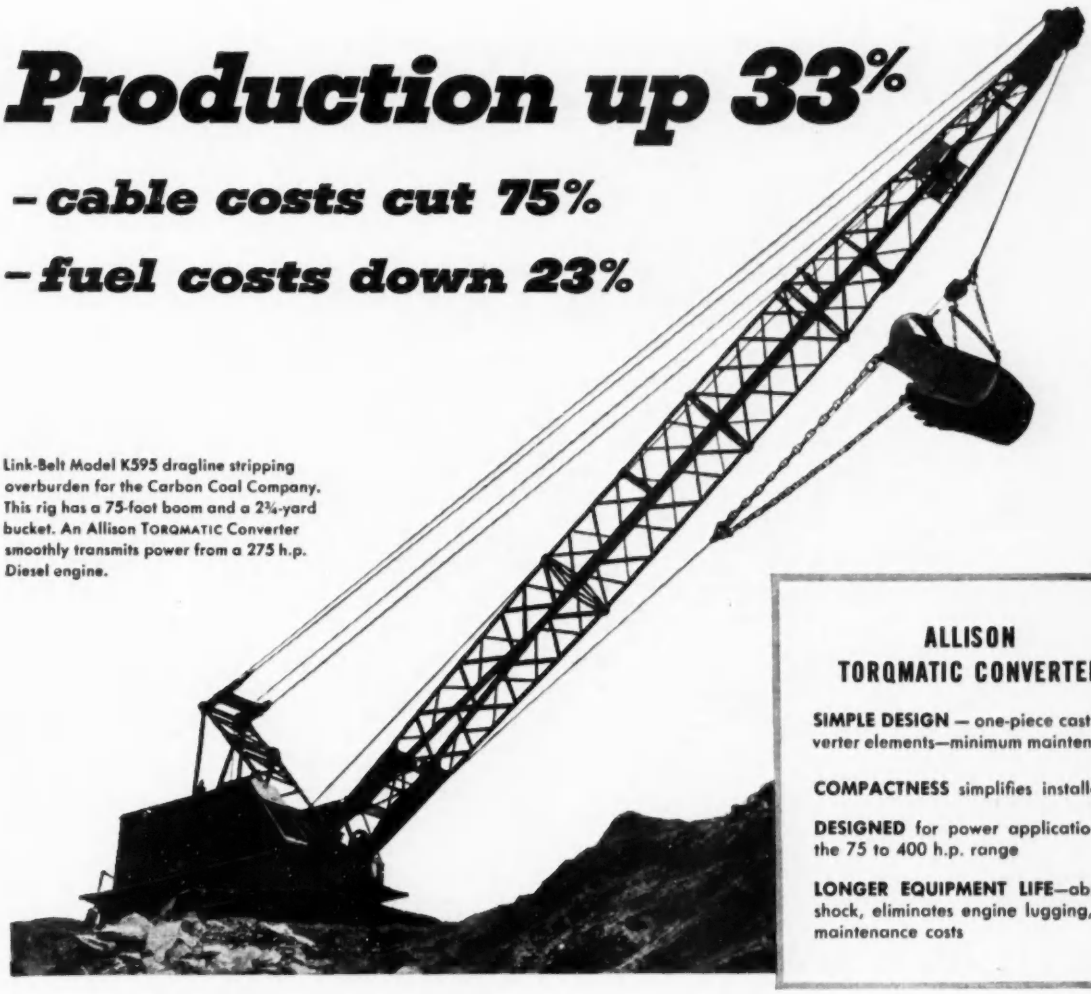
Builders of THE IMPACTER

"FORGING IN MID-AIR"

Production up 33%

-cable costs cut 75%

-fuel costs down 23%



Link-Belt Model K595 dragline stripping overburden for the Carbon Coal Company. This rig has a 75-foot boom and a 2¾-yard bucket. An Allison TORQMATIC Converter smoothly transmits power from a 275 h.p. Diesel engine.

ALLISON TORQMATIC CONVERTER

SIMPLE DESIGN — one-piece cast converter elements—minimum maintenance

COMPACTNESS simplifies installation

DESIGNED for power applications in the 75 to 400 h.p. range

LONGER EQUIPMENT LIFE—absorbs shock, eliminates engine lugging, cuts maintenance costs

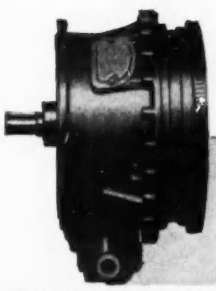
Here's another operator who's boosting production and cutting costs with Allison TORQMATIC DRIVES: The Carbon Coal Company operates two Link-Belt draglines, strip-mining coal near Grove City, Pa. The units are nearly identical—one has an Allison TORQMATIC Converter, the other is direct-driven—but there's a big difference in operating costs and production.

The Allison Converter absorbs shock loads so dragline cable on the TORQMATIC-equipped unit lasts four times as long, *saving $2160 a year on cable alone*, a reduction of 75%.

The TORQMATIC-equipped unit strips a 60x40x25 foot "lift" of overburden in 24 hours against 32 hours for the direct-driven unit, a 33% increase in production. A comparison of daily fuel records shows the friction drive unit consumes 130 gallons while the Converter-equipped unit uses only 100 gallons, a cut in fuel costs of 23%.

The TORQMATIC-equipped unit has rolled up such an impressive performance record that this operator intends to specify TORQMATIC DRIVES in all his new heavy-duty equipment. You, too, can cut your costs by specifying Allison TORQMATIC DRIVES the next time you buy. Ask your equipment dealer, manufacturer or write:

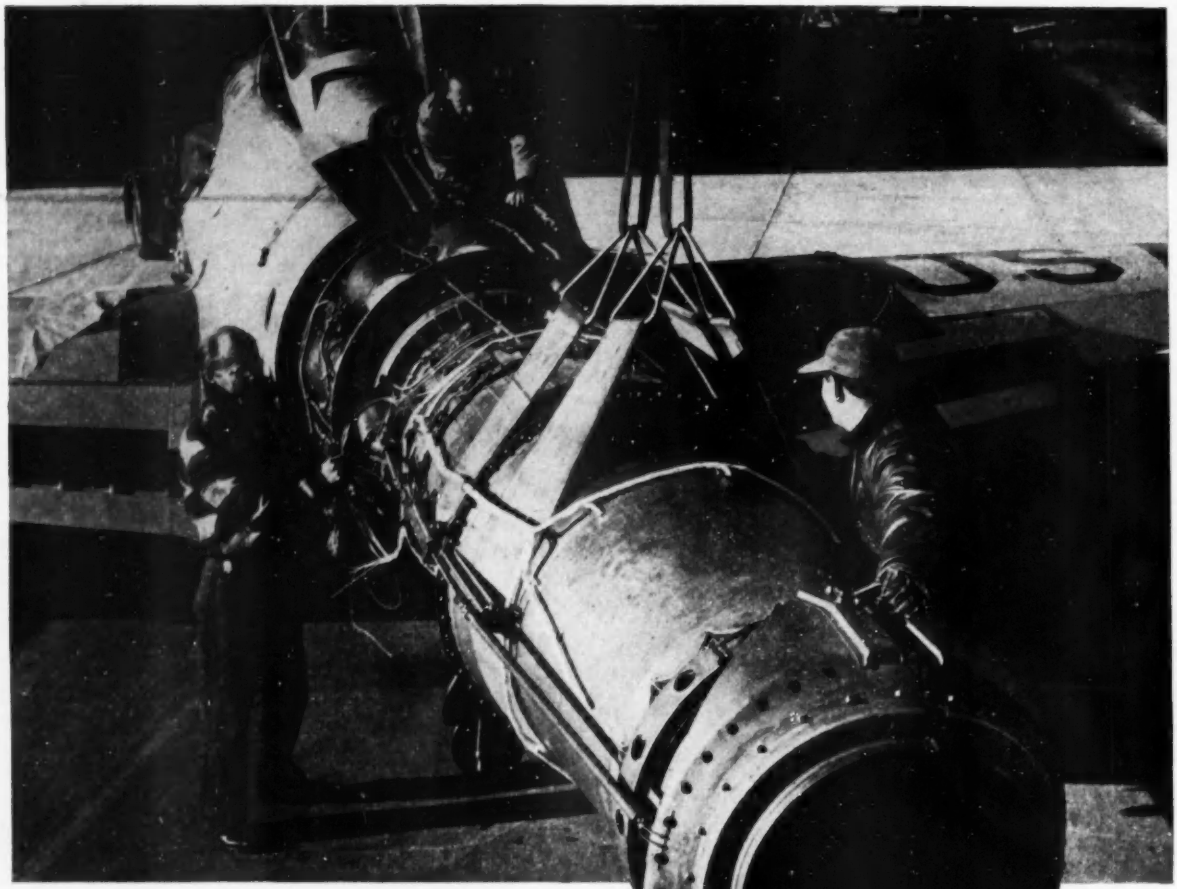
ALLISON DIVISION OF GENERAL MOTORS
Box 894AA, Indianapolis 6, Indiana



Allison **TORQMATIC DRIVES**

GM GENERAL MOTORS

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES * TRUCKS * TRACTORS * SCRAPERS * SHOVELS * DRILLING RIGS



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AERONAUTICAL ENGINEERS
ENGINEERING PHYSICISTS

. . . here's your chance to do *real* engineering !

If you want to explore new technical frontiers — this may be the opportunity you have been looking for.

At Pratt & Whitney Aircraft we are working on the most complex of engineering problems — the development of turboprop, turbojet, ramjet, piston and nuclear aircraft engines.

Because of the advanced nature of the work, you will have opportunities to work beyond present technical boundaries — gain professional recognition. You will learn from the engineers whose designs have gained world-wide acceptance for our products.

Security? Yes! Most of our advanced projects will continue well into the 1960's. And, in addition, you will have the stability of a company whose military and commercial sales totaled more than $600,000,000 last year.

Important, too, is the fact that you can live — bring up your family — in one of the small, friendly towns of Connecticut.

Why not send a complete resume to Mr. Paul Smith, Department AI8.

PRATT & WHITNEY AIRCRAFT
Division of United Aircraft Corporation
East Hartford 8, Connecticut

Send for free print

Early Pierce "Motorette" (1903) presented rakish appearance, with curved carriage front and "fly-away" rear mudguards. Powered by one-cylinder, five hp. engine, the "Motorette's" 720 lbs. were distributed on a 58" wheelbase. Four full elliptic springs, ball-bearing transmission shaft and rear axles were among its features.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free, enlarged copy, suitable for framing.

The equation that grew into an automotive byword offers solid advantages to you

MORSE

M=TC

Morse *means* Timing Chains

Solid advantages for *you* result from the years of practical applications and working experience that have won acceptance for this equation.

Applications? Eleven of the thirteen cars now using timing chain drives use Morse Timing Chain Drives as original equipment.

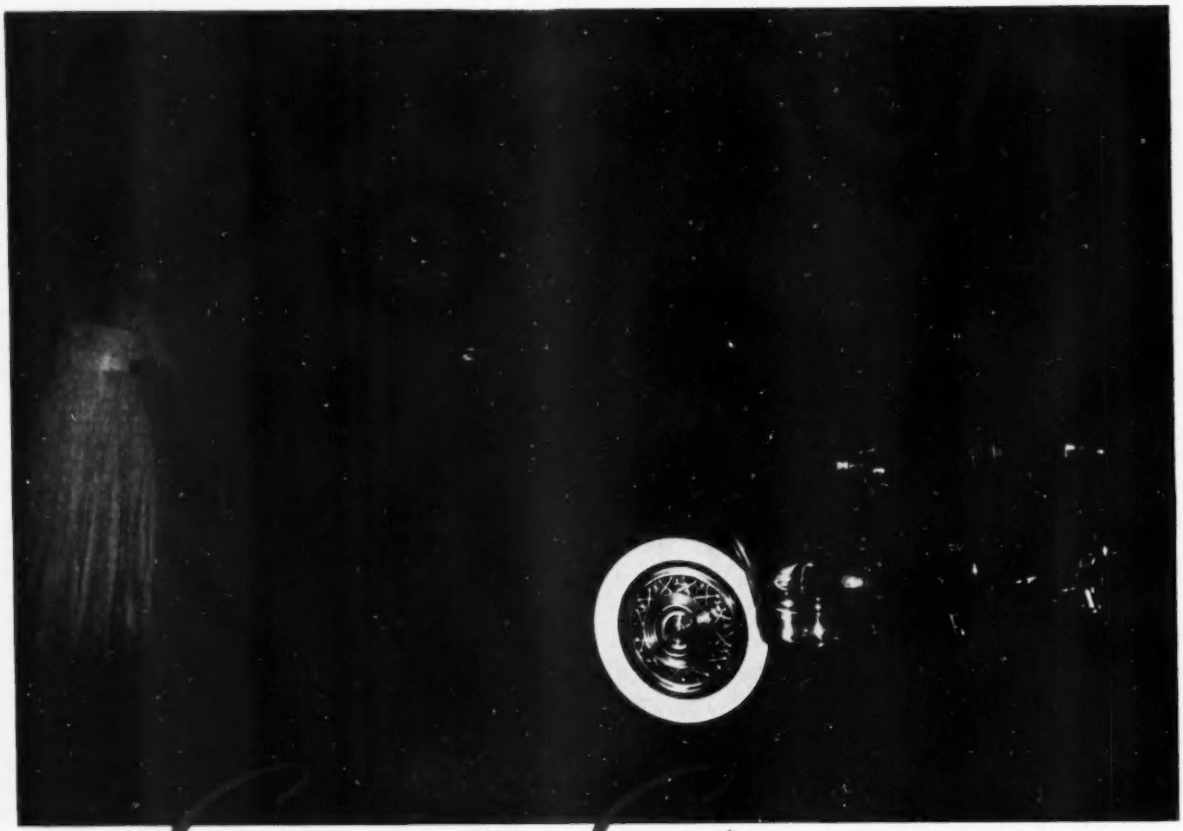
Experience? Many manufacturers have whipped problems in timing chain design, development, and application with the help of Morse's specialized technical and engineering skills.

Acceptance? Industrywide. You get—and can rely on—customer-conscious delivery that moves chains and sprockets to you right on schedule, right for the job.

Call or write us for information on *your* timing chain problems. We'll be glad to show you, in short order, *why* M=TC; Morse *means* Timing Chains—and *how* this applies to you.

MORSE CHAIN COMPANY

Dept. 507 • 7601 Central Avenue • Detroit 10, Michigan



Styled for Enhancement...

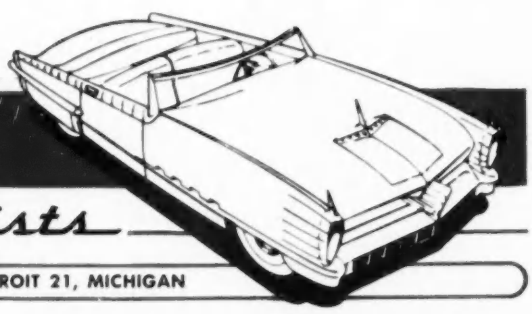
CAMPBELL WIRE WHEEL COVERS AND AUTOMOTIVE CHROME TRIM

Ultramodern beauty describes the American automobile today.

To enhance that beauty even more—the A. S. Campbell Company Inc. is currently manufacturing wire wheel covers as factory installed and accessory equipment for several of the country's leading automobiles.

Creation of entirely new automotive parts design coupled with extensive manufacturing facilities for volume production enables Campbell to closely work with automobile manufacturers in producing automotive parts and decorative chrome trim.

Campbell manufactures wire wheel covers as just one of many specially designed and engineered automotive items. For styling and engineering service and competitive quotations on contemplated parts we welcome your inquiry at our offices in Boston or Detroit.



A. S. CAMPBELL CO. INC.

styling specialists

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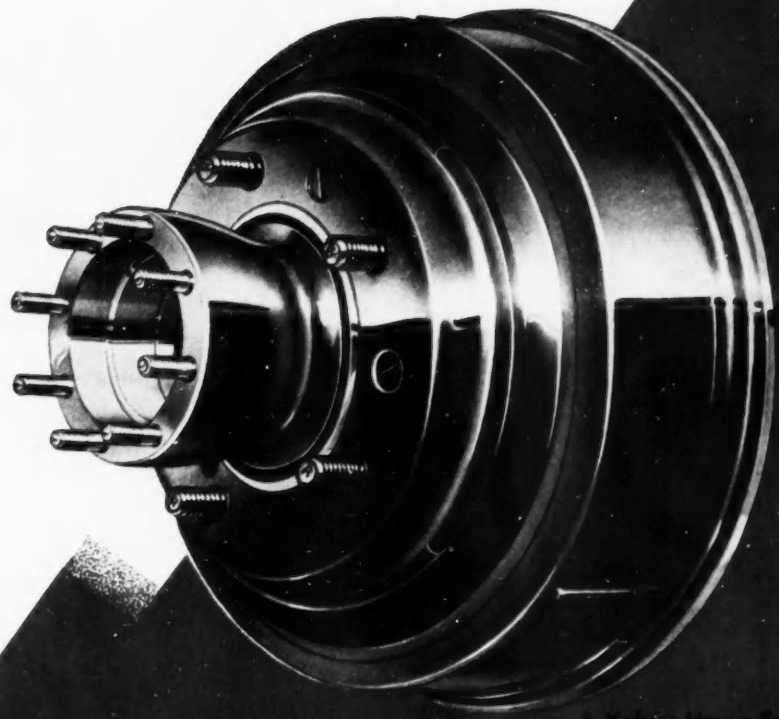
KELSEY-HAYES



A Kelsey-Hayes Truck Hub and Brake Drum Assembly

MAKERS OF QUALITY PARTS FOR THE AUTOMOTIVE INDUSTRY FOR FORTY-FIVE YEARS

Wheels, Brakes, Hubs and Drums . . . also Parts for Farm Implements and Aircraft

KELSEY-HAYES WHEEL COMPANY

DETROIT 32, MICHIGAN

PLANTS IN DETROIT AND JACKSON, MICHIGAN; McKEESPORT, PA.; LOS ANGELES, CALIF.; DAVENPORT, IOWA; WINDSOR, ONTARIO, CANADA

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S.O.S. —Sign Of Superiority —Symbol for Showroom Success

Leading manufacturers of finished products find that products by L. A. Young, included in them, add greatly to their successful showroom acceptance. Your use of any of the following—research developed and quality fabricated by L. A. Young—will give your products greater Showroom Superiority:

For Automotive:

Spring Units and "Flex-O-Lator" Padding
Supports for Seat and Back Cushions . . .
Garnish Mouldings—Decorative Trims . . .
Precision Mechanical Springs—Such
As Valve, Clutch and Brake Springs . . .
Instrument Dash Panel Stampings . . .
Diversified Wire Forms and Stampings . . .

For Home Furnishings:

Inner-Spring Units for Mattresses . . .
Bed Springs of Various Designs . . .
Flex-O-Lator Padding Supports for
Bedding and Furniture Industries . . .

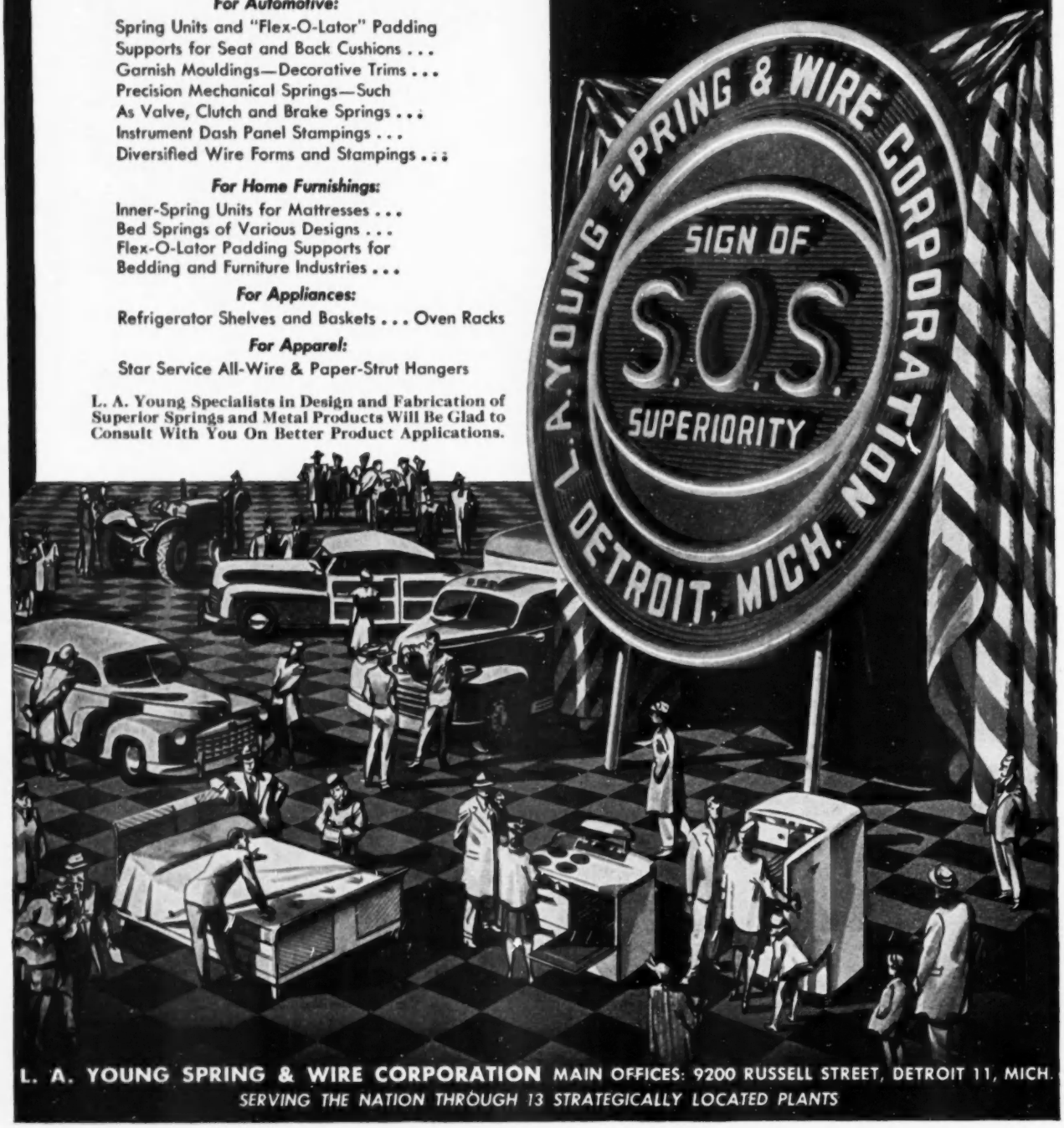
For Appliances:

Refrigerator Shelves and Baskets . . . Oven Racks

For Apparel:

Star Service All-Wire & Paper-Strut Hangers

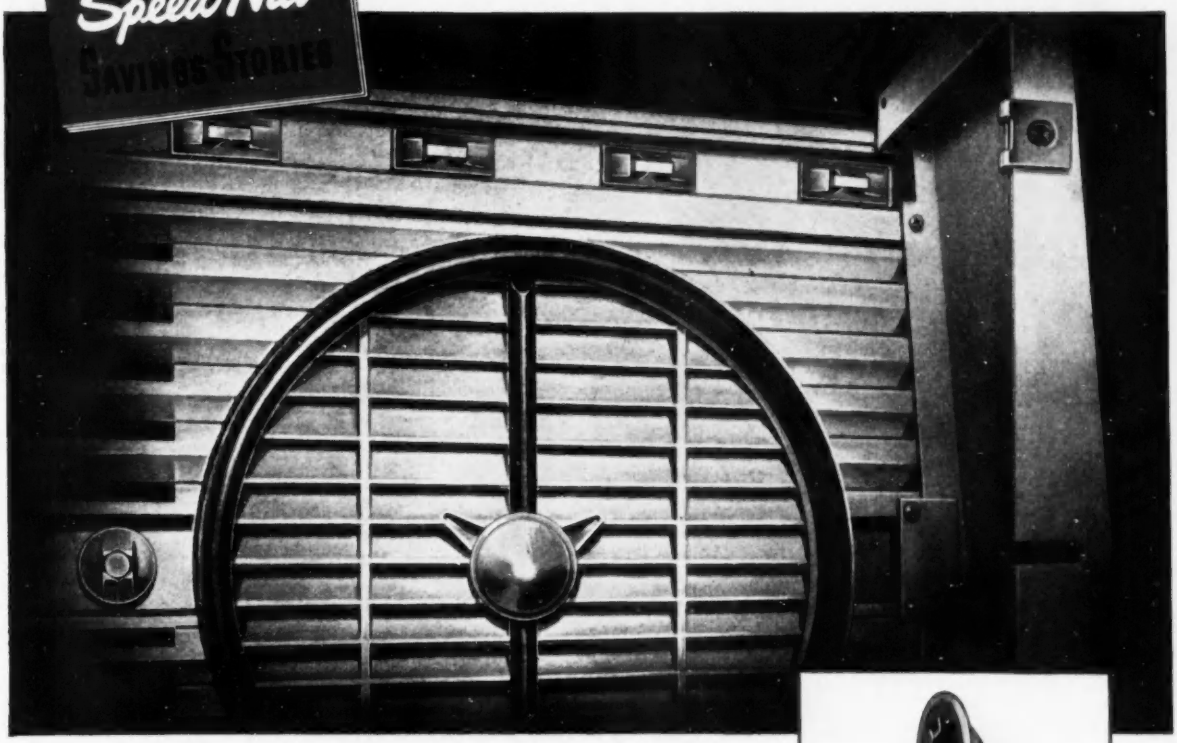
L. A. Young Specialists in Design and Fabrication of Superior Springs and Metal Products Will Be Glad to Consult With You On Better Product Applications.



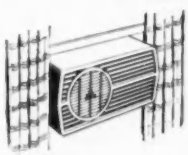
L. A. YOUNG SPRING & WIRE CORPORATION MAIN OFFICES: 9200 RUSSELL STREET, DETROIT 11, MICH.
SERVING THE NATION THROUGH 13 STRATEGICALLY LOCATED PLANTS

FASTEST THING IN FASTENINGS®

Speed Nut Savings Stories



SPEED NUTS® give new Room Air Conditioner "Cool" 82% Assembly Savings!

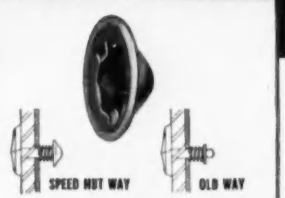


Fedders-Quigan Corporation, Buffalo, plans Tinnerman SPEED NUT savings in design stages

● The results of this fastening engineering greatly reduced assembly costs—brought substantial production increases! Fedders engineers are now using 35 Tinnerman SPEED NUT brand fasteners per unit . . . an increase of 200 percent in the new models, a tribute to SPEED NUT success! Typical of the savings achieved by Fedders is the 82% reduction in the cost of attaching the Comfort Circle grille with a Cap-Type SPEED NUT.

Looking for ways to convert fastening problems into savings? SPEED NUTS will help! These high quality, spring steel fasteners are light weight, vibration-proof and self-retaining; eliminate welding, staking, riveting; can be used over welded studs; do away with threaded inserts. These are a few of the SPEED NUT advantages that will annually save thousands of production dollars for Fedders-Quigan!

See your Tinnerman representative for full information on our free, cost-saving Fastening Analysis service.



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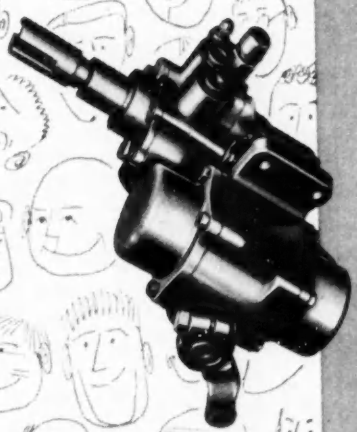

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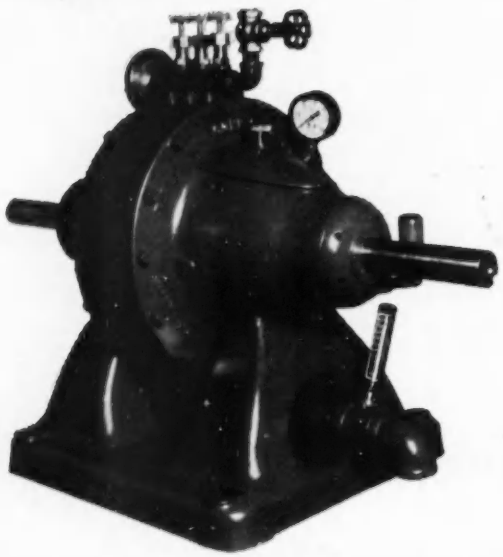

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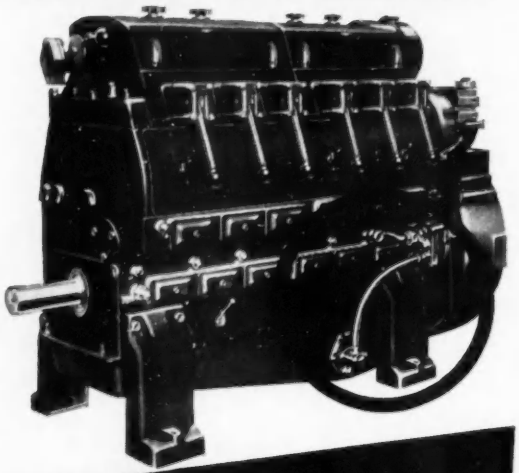

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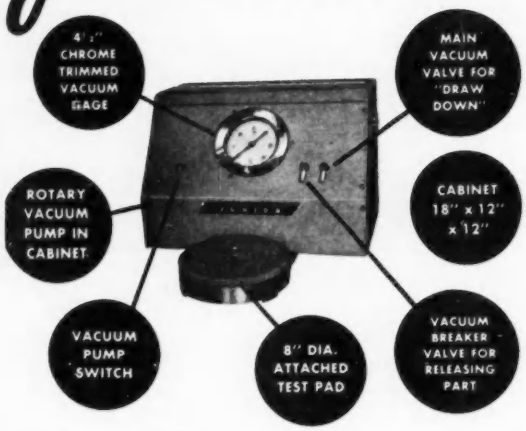
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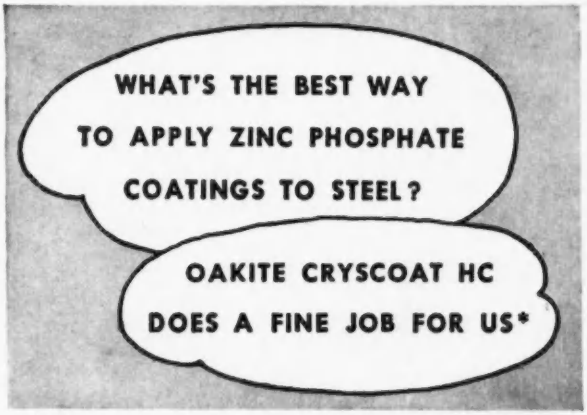

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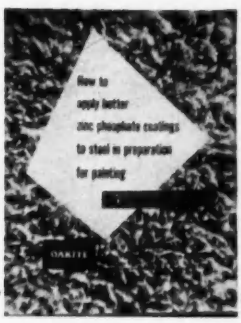

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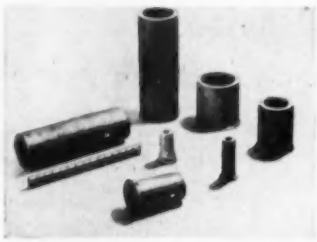

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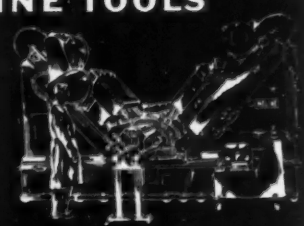

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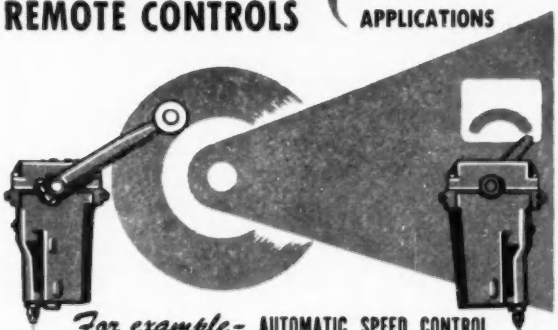

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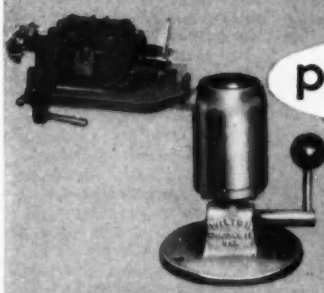

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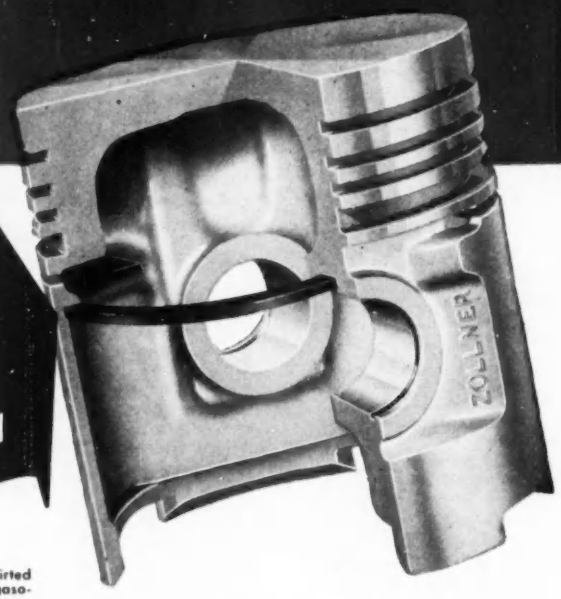

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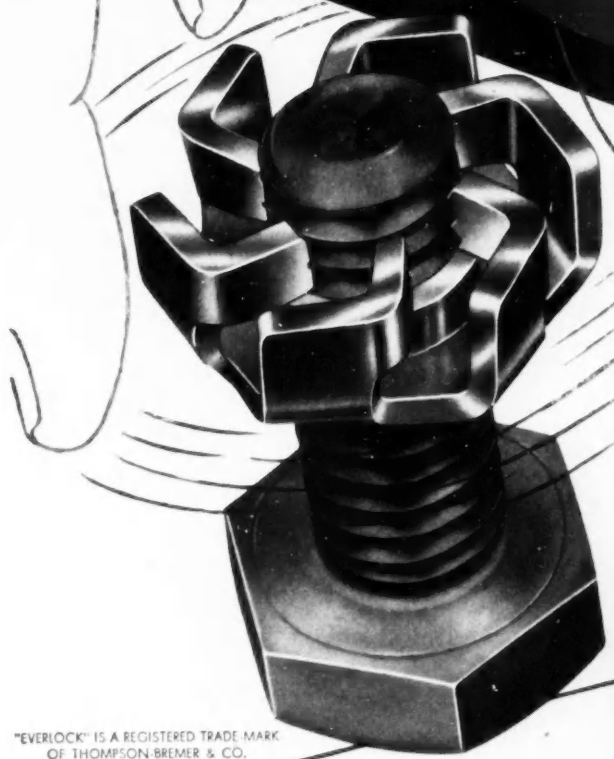

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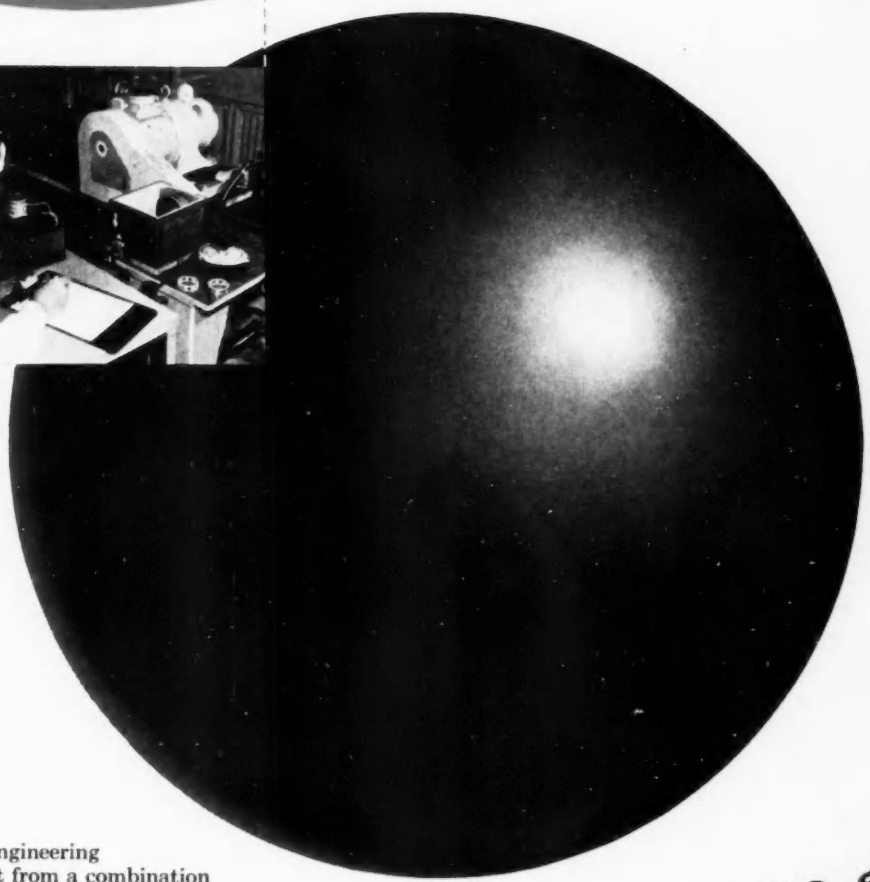

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